

The Causes and Consequences of Apprenticeship Training – an Economic and Econometric Analysis

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CHAPTER 1

Introduction

The German-style apprenticeship training system receives a lot of world-wide attention because it improves the school-to-work transition and thereby causes a lower youth unemployment rate (Soskice 1994, Harhoff and Kane 1997, Ryan 2001). This system further provides adolescents with sophisticated intermediate-level skills and allows enterprises to provide and pay for training in specific and general human capital (Steedman 1993, Soskice 1994, Acemoglu and Pischke 1999b). All these characteristics recommend this system as a potential model for other countries (Harhoff and Kane 1997, Ryan 2001, Steedman 2001, Schaack 2008).

To the contrary, the apprenticeship training market in Germany is frequently discussed in public and scientific press because a large number of applicants do not find an apprenticeship each year. This so called demand-supply gap on the apprenticeship training market has been continuously discussed and has been led to various economic policy measures aiming to increase the number of apprenticeship places in recent decades (Busemeyer 2009, Jacobebbinghaus et al. 2009). In spite of the advantages of an apprenticeship training system in an international perspective on the one hand and the discussions around the demand-supply gap on the other, empirical evidence on the functioning of this market is rare so far (Frick 2006). Empirical studies mainly focus on company's cost-benefit ratio of apprenticeship training (Beicht et al. 2004, Wolter et al. 2006), determinants of apprenticeship training companies (Harhoff and Kane 1997, Beckmann 2002), individual mobility after apprenticeship training (Winkelmann 1996, 1997, Euwals and Winkelmann 2004) and individual wage returns (Bender and Wachter 2006, Boockmann and Steiner 2006, Tuor and Backes-Gellner 2010).

This thesis investigates firms' motivation to train apprentices and contributes to the first two literature strands. Understanding firms' training motivation is the key to explain the functioning of the apprenticeship training market. A better understanding of the apprenticeship training system allows an enhanced comparison to other adolescent training systems in an international perspective and more sophisticated design of policy measures

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intended to influence the apprenticeship training market. In detail, this thesis shows, first, the heterogeneity of firms' training motivation and presents solutions to measure the heterogeneity. Second, it demonstrates effects of the heterogeneous training motivations on firms' human resource management strategy. Third, this thesis analyses interdependences between the apprenticeship training market and the industrial relations system.

Identifying firms' motivation to train apprentices is a major concern in economic theory. Until recently, the investment training motive was generally considered as the prevailing training motivation, i.e. the companies pay for the provision of general human capital and they do not recoup their costs until the end of the training period. The net costs assumption stems from a series of descriptive cost-benefit-studies conducted by the BIBB (Bardeleben et al. 1997, Beicht et al. 2004, Wenzelmann et al. 2009). Based on this stylized fact, an extensive literature singles out the economic rationale behind this training motivation. Many contributions explain the willingness of firms to pay for general human capital by different sources of market imperfections such as monopsony, asymmetric information on personal traits and training contents, search and mobility costs, and labour market institutions such as unions or minimum wages. These contributions argue that the market imperfections allow firms to pay their own apprenticeship graduates less than the market wage for skilled workers and hereby recoup net costs incurred during the apprenticeship period (Franz and Soskice 1995, Harhoff and Kane 1997, Acemoglu and Pischke 1998, 1999a, Leuven 2005, Kessler and Lülfselmann 2006). More specifically, Acemoglu and Pischke (1999a) show that two conditions hold for the willingness of firms to pay for training: firms earn profits on workers and these profits increase with advanced training level.

In addition to the theoretical impact, the stylized fact about firms' training motivation is one of the keys for understanding and evaluating the German-style apprenticeship training. However, the fact itself has not been subjected to scrutiny by alternative methods or data-sets even if theoretical considerations and empirical evidence from other countries stress the relevance of two opposing training motivations: the investment and the substitution/production motivation (Lindley 1975, Stevens 1994, Soskice 1994, Franz and Soskice 1995, Harhoff and Kane 1997, Smits 2006, Wolter et al. 2006, Smits 2007, Zwick 2007, Festerer et al. 2009). A substitution strategy, sometimes also named production strategy, means that the training company employs apprentices as substitutes to unskilled or semi-skilled workers because of their lower unit labour costs. Contrary, the investment strategy is defined as training companies bear net costs during training period and benefit by

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employing skilled workers later on. The main motive of this strategy is to take advantage of skilled workers rather than investing, as the name suggests.

The thesis scrutinizes the stylized fact that almost all companies incur net costs while training apprentices. The thesis highlights that companies' training motivation is not homogeneous. Heterogeneous training motivations requires a more careful evaluation of policy measures designed to increase the supply of apprenticeships in order to close the demand-supply gap on the apprenticeship training market (Busemeyer 2009, Jacobebbinghaus et al. 2009). For example, both training motivations lead to different effects of lower wages for apprentices as a policy measure to close the demand-supply gap on the apprenticeship training market. This measure increases the demand of apprentices regarding the substitution motivation but has no effect on the demand concerning the investment training motivation.

Chapter two presents a method for identifying both training strategies. This approach uses publicly available establishment-level data and identifies the training motivation based on the within-firm retention rate over several years, defined as the average proportion of apprentices staying in the training company in relation to all apprenticeship graduates of a company over several years. The rationale behind this approach is that retaining own apprenticeship graduates is a necessary condition when an establishment trains for investment reasons, but it is more an exception than a rule when training is based on substituting apprentices for unskilled employees because of lower relative unit labour costs. The within firm retention rate shows a strong clustering on both extremes of the distribution. Approximately 26 percent of all training firms hire all own apprenticeship graduates and 14 percent retain no-one over several years. Chapter two shows further that this classification fits to the one based on costs-benefits data (marginal cost approach). The figure of a strong clustering of the long-term retention rate adds a new and interesting stylized fact of apprenticeship training. The fact that 14 percent of training companies do not retain their own apprenticeship graduates contradicts the hypothesis that apprenticeship training in Germany homogeneously follows an investment training motivation.

Chapter three studies firms' training motivation in a different way and analyses whether German enterprises accept short-term disadvantages regarding productivity and profitability when they offer apprenticeships. In contrast to the descriptive costs and benefits evaluations, chapter three cannot directly measure the net costs of apprenticeship training during the apprenticeship period. Chapter three analyses, however, the arguably more relevant question whether establishments that increase the share of apprentices at the cost of the share of unskilled employees face a reduction in their profits and how establishment productivity is

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affected. Taking into account relevant factors for establishment performance, endogeneity of qualification shares and unobserved time-invariant establishment heterogeneity, chapter three identifies the causal impact and shows that the apprenticeship training occupation makes a difference when comparing the impact of apprentices and unskilled workers on productivity and profitability. Employing apprentices instead of unskilled or semi-skilled employees in trade, commercial, craft, and construction occupations has a positive impact on contemporary establishment productivity and profitability whereas substituting apprentices for unskilled workers in manufacturing occupations has a negative effect on contemporary establishment profits but no effect on contemporary productivity.

Both chapters analyse effects of apprenticeship training during the training period and pronounce the heterogeneity of the system in terms of firms' training motivation. The investment and the substitution training motivation are prevalent in the apprenticeship training market. The heterogeneity challenges the design of policy measures intended to influence the apprenticeship training market.

Furthermore, the existence of both training motivations influences also the recruitment strategy of training and non-training companies which is the second key question of this thesis. The recruitment of apprenticeship graduate is of empirical interest because freshly trained workers are prone to be poached. The apprenticeship training system provides company-sponsored training investments in transferable skills and the training contract legally terminates at the day after the final exam when an employment contract has to be signed. These characteristics can lead to positive externalities for other firms when freshly trained apprenticeship graduates leave the training firm, which has invested in the human capital of the apprentice (poaching). Such poaching externalities can lead to an under-investment in training (Stevens 1994, 1996, 2001, Booth and Snower 1995, Acemoglu 1997, Leuven 2005). Under-investment in training undermines competitiveness and economic growth and is of major concern for managers and politicians. Indeed, several theoretical contributions conclude that a poaching externality does not exist on the apprenticeship training market because of several market imperfections (Chang and Wang 1996, Acemoglu and Pischke 1998, Lazear 2009, Leuven et al. 2004, Moen and Rosen 2004, Leuven 2005). The existence and extent of a poaching remains an empirical question which has not been analysed so far (Pischke 2007, Brunello and DePaola 2009).

Chapter four analyses the recruitment of apprenticeship graduates as a form of poaching. Measuring poaching is an empirical challenge which requires linked employer/employee data and, more important, that trained workers can be distinguished from non-trained ones. Then,

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we can identify poaching firms, training firms, apprenticeship graduates switching between both and apprenticeship graduates staying in the training firm (Pischke 2007). Apprentices, apprenticeship graduates and their training and poaching companies can clearly be identified in social security records linked to establishment-level data. Apprentices are particularly appropriate for poaching analyses because apprenticeships are a common training measure of company-sponsored training investments in transferable skills, which are observable by outsiders (Soskice 1994, Harhoff and Kane 1997, Acemoglu and Pischke 1998, Culpepper 2003). Recruiting freshly trained apprenticeship graduates reveals a positive externality for the recruiting firm which can earn a rent on these skilled employees. A switching and costly trained apprenticeship graduate means anyhow an investment loss for the training firm. Training companies which have invested in training but cannot attract their trained employees may eventually train a lower number of apprentices or with a lower training quality. We show that poaching exists and that poaching companies more likely train apprentices themselves. Contrary, poached companies fail to credibly offer long-term contracts.

The final contribution of this thesis is the institutional framework of apprenticeship training. Even if the apprenticeship training motivation implies incentives for companies to provide training, both training motivations require a framework within which companies can train and partly pay for formally certified skills. The framework or the institutions are the financial system, production of niche products and, most important, the industrial relations system. These institutions may explain why the German-style apprenticeship system works and the apprenticeship system in Britain is currently declining (Finegold and Soskice 1988, Streeck 1989, Soskice 1994, Gospel 1995, Gospel 1998, Backes-Gellner 1996, Ryan 2000, Ryan 2001, Culpepper 2003, Dustmann and Schönberg 2008, Lewis and Ryan 2009). Even though we know only little about economic effects of apprenticeship training, interdependencies between apprenticeship training and institutions are also a hardly researched field.

Chapter five analyses the works councils as one key institution which supports the apprenticeship training system. The industrial relations system comprises employer and employee organisations. These organisations create trust and provide a grievance system for the market participants, both of which are the basis for an apprenticeship training system. On the one side, the apprenticeship training system depends on the ability of private employer organisations – notably, employers associations and chambers of craft and commerce – to provide employers with capacity of information circulation, deliberation, monitoring and sanctioning, which allow them to minimize the risk of opportunistic behaviour on the part of other employers (Hall and Soskice 2001, Culpepper 2003). On the other side, the

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apprenticeship training system depends on the participation of apprentices who trust their representatives who monitor that employers do not exploit apprentices during the training period and train marketable skills. Employee associations such as unions bargain about apprenticeship training regulations on the national level and works councils monitor training implementation on the establishment-level. Apprentices in establishments with a works council can elect a representative who, as a part of the works council, monitors the laws, regulations, collective and work agreements about the implementation of apprenticeship training (§ 70 Works Council Act).

Chapter five provides a first systematic analysis whether apprenticeship training is correlated with the establishment of a works council. Chapter five finds no significant effect. However, this result does not reject the hypothesis that the industrial relations system provide a framework within which companies can train and partly pay for formally certified skills but shows that single institution cannot explain it. Thus, future research should analyse bundles of institutions or the whole system rather than a single institution.

The final chapter concludes. First, it shows that heterogeneous training motivations allow within-country analysis to understand an apprenticeship training system additionally to between-country analyses. Second, it presents policy implications and discusses why policy measures designed to influence the apprenticeship training market have to consider both training motivations. For instance, increasing the number of training days in vocational schools to practice a foreign language, for instance, raises the demand of apprentices regarding the investment and decreases the demand regarding the substitution motive.

CHAPTER 2

Apprenticeship Training – What for: Investment or Substitution?

in: International Journal of Manpower, forthcoming (2010) with Uschi Backes-Gellner

2.1 INTRODUCTION

The apprenticeship system in Germany is generally considered to be a company investment in human capital. This common belief is mainly based on the results of the German cost-benefit studies of the BIBB (for latest results cf. Beicht *et al.* 2004), which estimated that almost all companies have sizeable net costs of apprenticeship training.¹ Since apprenticeships are unanimously considered to offer general skills these findings have motivated many researchers to study the role of market imperfections as an incentive for the training decision of companies (Franz and Soskice 1995, Acemoglu and Pischke 1998, 1999a, Dustmann and Schönberg 2009, Kessler and Lülfselmann 2006). Based on these theoretical discussions, the German apprenticeship system is often used as the institutional setting for empirical investigations of company sponsored general training (Harhoff and Kane 1997, Acemoglu and Pischke 1998, Dustmann and Schönberg 2009). These empirical studies implicitly assume that all German firms which train apprentices invest in human capital but none of these studies actually checks this fact. However, in addition to an investment view, Lindley (1975) already argues that there may be a second motivation for apprenticeship training, namely a production or substitution strategy. He describes apprentices as productive workers who are used as cheap substitutes for unskilled or semiskilled workers. The substitution motivation states that the productivity of apprentices (who are used as regular production workers) is higher than their training costs and that the unit labour costs of apprentices are lower than the unit labour costs of other (unskilled) employees whom they substitute.

So the first aim of our paper is to study whether the German apprenticeship system is indeed homogeneously a human capital investment of the companies. We develop an alternative

¹ This refers to the full cost account which is usually cited in scientific papers.

method which can be used with publicly available company data to identify the two training strategies of firms. We argue that a sufficient condition to distinguish between the two training strategies is the within firm retention rate over several years, defined as the average proportion of apprentices staying in the company in relation to all apprenticeship graduates of a company over several years. If an engagement in apprenticeship training is supposed to be an investment in human capital that earns long term returns for the company, such earnings are clearly only possible if a sufficient number of apprentices stays in the company after they have finished their apprenticeship (see the integrated model of Acemoglu and Pischke 1999a). In contrast, a substitution strategy does not require that apprenticeship graduates stay within the training company because offering apprenticeships is driven by the unit labour costs of apprentices in comparison to suitable substitutes. If apprentices are indeed used as cheap workers during the apprenticeship it can to the contrary be expected that they are too expensive after their apprenticeship, meaning that retaining apprentices is rather the exception than the rule. If we look at the long-term within-firm retention rate we find a strong clustering on both extremes of the distribution. Overall, 18.5 percent of the companies nearly never hire their own apprenticeship graduates, while 43.75 percent of the companies hire almost all of their own apprenticeship graduates. We argue that companies which never hire their apprenticeship graduates can be clearly assigned to the substitution strategy and that companies which hire almost all of their graduates can clearly be assigned to the investment strategy. Based on this classification method we find evidence for a non negligible share of companies with a substitution strategy (around 18.5 percent of all training companies). This result is in contrast to the widely accepted stylized fact of a pure investment strategy of German firms.

In a second step, we show the reliability of our classification method by comparing it with descriptive results of the most recent German cost benefit study. In a third step, we study the determinants of companies using a substitution strategy. We first find that the probability of the substitution strategy increases with lower capital equipment, with the absence of works councils and with a higher share of white collar workers as well as in smaller firms. We further find that service sector firms have a significantly higher probability to follow a substitution strategy than manufacturing firms. Finally, we found complementarities between firms' investments in apprenticeship training and firm sponsored continuing training.

The paper is structured as follows. After a short literature review (section II), important institutional settings are introduced and the within firm retention rate is defined. Then, the company training strategies are verified by a comparison with the cost-benefit studies (section

III). Afterwards, we estimate determinants of a substitution training strategy (section IV) and conclude with theoretical and policy implications (section V).

2.2 LITERATURE REVIEW

According to Beicht *et al.* (2004) 96 percent of the training companies incur on average net costs during the apprenticeships.² They conclude that the investment strategy clearly dominates while the substitution strategy can only be found on the fringes. This stylised fact has motivated many researchers to study the role of market imperfections as a source of the investment of German companies in apprenticeships that provide general skills (Franz and Soskice 1995, Acemoglu and Pischke 1998, 1999a, Dustmann and Schönberg 2009, Kessler and Lülfselmann 2006). The theoretical models explain the incentive of companies to invest in apprenticeships through asymmetric information (Acemoglu and Pischke 1998), complementarities between general and specific human capital (Franz and Soskice 1995, Kessler and Lülfselmann 2006) or labour market institutions such as unions (Dustmann and Schönberg 2009). Acemoglu and Pischke (1999a) integrate different theoretical models in one general framework. In contrast to the frequently modelled investment strategy, the substitution strategy is mostly intuitively introduced. The substitution strategy can be analysed by a simple microeconomic production model with two substitutable input factors (e.g. apprentices and unskilled workers) in which employment is only dependent on the relative unit labour costs (substitution of two input factors). However, Lindley (1975) studied this strategy in a more complex and formal analytical framework.

According to the theoretical discussions the German apprenticeship system is used as the institutional setting for empirical investigations of company sponsored general training (Harhoff and Kane 1997, Acemoglu and Pischke 1998, Dustmann and Schönberg 2009), but the assumption of positive net costs are not been tested. Some of these empirical studies however stress that apprenticeship training strategies are not unique across sectors and firm sizes (Soskice 1994, Franz and Soskice 1995 or Neubäumer and Bellmann 1999). For example, an increasing training incidence by firm size is explained by the presence of internal labour markets in larger firms. A first doubt on the overwhelming dominance of net cost argument in Germany occurs by the Swiss cost benefit study of Wolter *et al.* (2006). They find that only one half of the larger firms and one third of the smaller firms incur net costs during the apprenticeship. The huge differences are somewhat surprising because of the similarity of both

² The cost benefit study of Beicht *et al.* (2004) comprises two estimations. Here, we report only the full cost approach, because this is always cited in scientific publication. Both approaches are shown in section four.

training systems. However, Dionisius *et al.* (2009) show that a part of the difference can be explained by a higher share of productive tasks allocated to apprentices in Switzerland and the differences in comparatively lower apprentice to skilled worker wages. Finally, Zwick (2007) estimates the contribution of changes in the proportion of apprentices on changes in firm performance in Germany. He found an insignificant and not a negative effect of the share of apprentices on productivity which would be expected in a pure investment strategy. He concludes that the investment and the substitution strategy may outweigh each other on average and that the cost benefit study of Beicht *et al.* (2004) might underestimate the substitution strategy.

However, most of the cited theoretical and empirical studies fail to discuss explicitly the retention rate of apprenticeship graduates as a necessary precondition for a return on investment. One exception is the theoretical model of Acemoglu and Pischke (1999a) in which the retention rate is seen as an important training incentive. Empirical studies on the retention rates in Germany focus only on the individual rather than on the company. These studies estimate the effect of mobility of apprenticeship graduates on wages or duration of the first job after apprenticeship (see Euwals and Winkelmann 2004 for a discussion). There are also a few studies investigating different sectoral retention rates e.g. by Schwerdt and Bender (2003) who estimate the probability of an employer changing of apprenticeship graduates and Büchel and Neubäumer (2001) who estimate the determinants of an employment in the training occupation for apprenticeship graduates. For Switzerland, Wolter and Schweri (2002) analyse the retention rate more in depth and show that the strategy of retaining apprenticeship graduates immediately after training depends substantially on the benefits derived after the apprenticeship but less on firms' net costs during the training period. Furthermore, they find that firms which employ their apprenticeship graduates three years after graduation have heavily invested during the apprenticeship. However, to the best of our knowledge there is so far no empirical analysis based on German company data and studying the relation of retention rates and apprenticeship training on company level.³

2.3 WITHIN FIRM RETENTION RATE AS AN INDICATOR FOR FIRMS' TRAINING STRATEGIES

We argue that a sufficient condition to distinguish between the two training strategies, investment or substitution motive, is the within firm retention rate which is defined as the pro-

³ The German cost benefit studies use three year average retention rate to estimate the benefits of the apprentices training, but they do not report the rates.

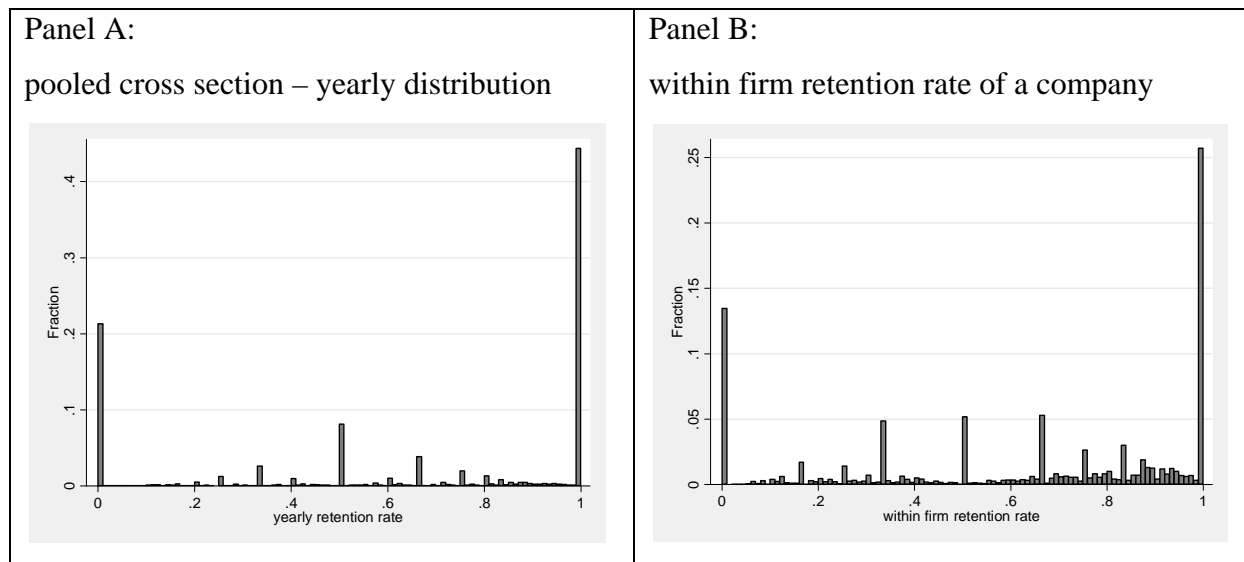
portion of apprentices staying in the company in relation to all apprenticeship graduates of a company. If a firm's engagement in apprenticeship training is supposed to be an investment in human capital, such earnings are clearly only possible if a sufficient number of apprentices stays in the company after they have finished their apprenticeship (see the integrated model of Acemoglu and Pischke 1999a).⁴ Consequently, if companies were to follow an investment strategy a minimum number of retained apprentices would be a necessary precondition because without any apprentice staying at the company positive returns on investment are not possible. In contrast, a substitution strategy does not require that apprenticeship graduates stay within the company to make it economically successful because under a substitution strategy offering apprenticeships is driven by the cheap labour costs of apprentices in comparison to their productivity during the training period. If apprentices are indeed used as cheap labour it can be expected - contrary to what was expected above - that after the apprenticeship is finished the same person is too expensive in comparison to its productivity, meaning that retaining apprentices is rather the exception than the rule. So if the retention rate is always zero this can be assumed to be a reliable indicator for a substitution strategy.

However, in order to reliably discriminate between companies following an investment or a substitution strategy, one additional condition has to be met. Since apprentices are always employed under fixed-term contracts (which are terminated at the end of the apprenticeship programme), apprentices themselves may decide not to stay in the company, meaning that not all apprentices are necessarily staying in the company even if a company with an investment motive would want them to stay. Instead, some of the apprentices may as well decide to leave the training firm after their apprenticeship. To account for this problem we look at the retention rate over several years to get a more reliable identification strategy for a company's training motive. We argue that if a company which invests in apprenticeship training over several years cannot attract a substantial share of their apprenticeship graduates to stay in the firm, it is requested to withdraw from apprenticeship training because otherwise it keeps having negative instead of positive returns to their investment. So even if we are not able to discriminate between contract terminations induced by the firm or by the apprentice, it still helps to single out firms following a substitution motive because a positive within firm retention rate over several years is a precondition for positive returns to the investment. Thus the within firm retention rate helps us to empirically distinguish between the two training strategies.

⁴ In the investment strategy the investment period is defined as the training period and the return period is defined as the employment of own apprenticeship graduates.

In order to do so we calculate the average yearly retention rate of apprenticeship graduates based on the waves 1996 – 2005 of the IAB Establishment Panel. This representative survey collects yearly information about the number of apprentices, graduates and stayers and a large number of general firm characteristics (see Kölling 2000). The retention rates immediately after completion of the apprenticeship is relatively stable and vary between 60 and 67 percent, corresponding to Euwals and Winkelmann (2004) or Franz and Zimmermann (2002).⁵ So in the short run only about one third of apprenticeship graduates leave the training firm.

Figure 2.1: The pooled cross section retention rate and the within firm retention rate of apprenticeship graduates in the year 2003.



Source: IAB Establishment Panel, companies in 2003, N= 2697, the within firm retention rate is based on own calculation of the waves 1996 – 2005.

However, the yearly mean of the retention rate is a result of a strong clustering on both extremes of the retention rate distribution (see figure 1 panel A) which shows that on the left end of the distribution nearly 21 percent of all companies do not hire their own apprentices and on the right end of the distribution almost 45 percent of the companies hire all of their apprenticeship graduates. The strong clustering of the retention rate distribution is similar in every year. However, to identify the training motive of one particular company we need the retention rate of a particular firm over a minimum number of years and we name this the within firm retention rate and study it over several years (for all training firms for whom we

⁵ The Berufsbildungsbericht as well as the study of Schwerdt and Bender (2003) use the weighted retention rates, whereby the weight is the inverse of the sample probability to the IAB Establishment Panel. The weighting leads to a 10 percent lower retention rate on average.

observe graduates in at least three years; see figure 1 panel B for the 2003 distribution).⁶ The distribution of the within firm retention rate over all firms shows a similarly strong clustering on both extremes of the distribution. Companies on the left end of the distribution in panel B of figure 1 never hire their own graduates over several years. At minimum, these 14 percent of all training companies can definitely not follow an investment strategy because they have no possibility of gaining returns after the investment period, i.e. after the apprenticeship termination. Thus the benefits have to be extracted during the apprenticeship period. In contrast, the companies on the right end of the distribution (25 percent) retain all their apprentices, clearly indicating that it pays to keep apprentices as skilled workers after they finish their apprenticeship.

For a structural comparison of our results with results from earlier studies, namely Beicht *et al.* (2004), we use the following definition for a substitution or an investment strategy based on the distribution of within firm retentions: We define a firm to follow a substitution strategy, if the within firm retention rate is lower than 20 percent (these are firms on the far left end of the distribution in figure 1 panel B). We define a firm to follow an investment training strategy if the within firm retention rate is higher than 80 percent over three years (these are the firms on the far right end in figure 1 panel B). These somewhat broader definition criteria have as another advantage that they also include companies which diverge slightly from their general retention policy due to an unexpected mismatch between the apprentices and the firm. According to this classification 18.5 percent of the companies' follow a substitution strategy and 43.75 percent follow an investment strategy.⁷

Although the low data requirements make this classification very attractive, we have to keep in mind the underlying assumptions when interpreting the results. First, firms with a clear strategy may have to change their ex-ante strategy for example due to a deteriorated economic situation which accordingly to our classification strategy would result in a classification into the undetermined category. This bias can occur in both training strategies; therefore both numbers have to be considered as a lower bound.⁸ A second limitation arises because training companies with only one apprentice require a longer observation period to be classified adequately. For example, a small company with only one apprentice can only be classified, if we observe at least three graduations during a 10 year period, for example in 1998,

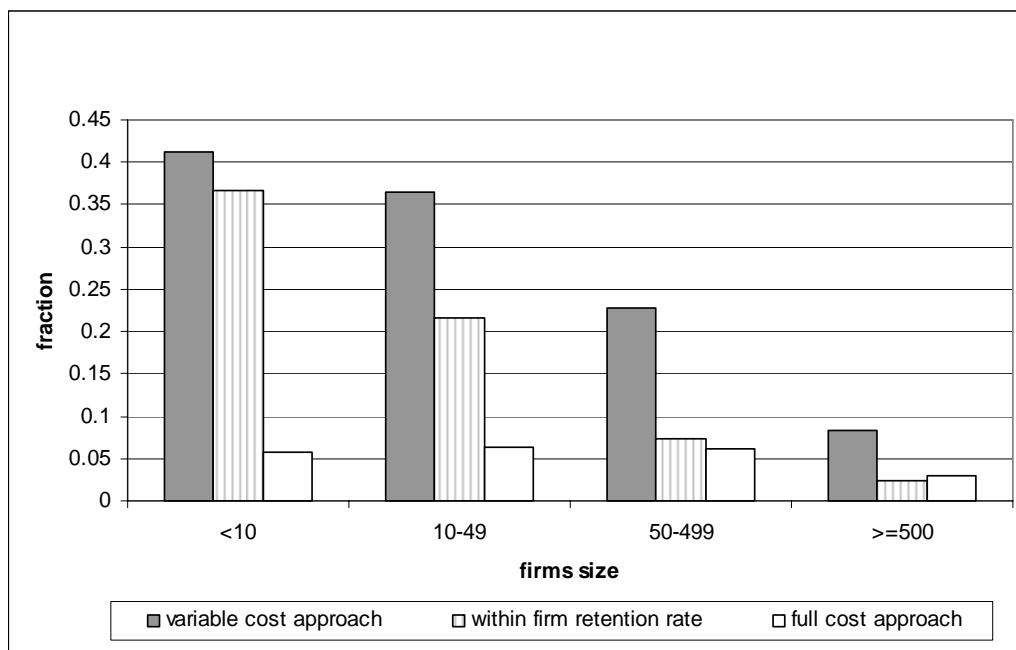
⁶ The retention rate distribution remains stable if we extend the minimal observation of graduates to 4 and 5 years but the number of observations naturally decreases (see appendix). This especially occurs in small firms which train only one apprentice.

⁷ If we vary the training strategy cutting points between 15/85 and 25/75 percent the summary statistics remain stable, but logical, there changes the number of companies. All following results are additionally calculated for different cut off points, which are shown in the appendix.

⁸ In around 4 percent of the companies, we observe that no apprenticeship graduate is hired in one year and all graduates are hired in all other years. The other way around is observed in around 1.5 percent of the firms.

2001 and 2004. This may lead to a lower share of small firms in the classification sample than in the whole population. Thus, training strategies are less precisely identified for small companies, i.e. the margin of error is larger. Third, firms with an investment strategy may also be misclassified if the firm purposefully decides to train more apprentices than required because they use the apprenticeship as a screening period as well. This would underestimate the investment strategy.

Figure 2.2: Comparison of the substitution strategy by firm size between the within firm retention rates and the cost benefit analyses of Beicht *et al.* (2004)



The data are provided by Günter Walden basing on the study of Beicht *et al.* (2004). The within firm retention rate is based on the IAB Establishment Panel.⁹

A comparison of our classification of the training motivation is very similar with what has been found in the cost benefit study of Beicht *et al.* (2004). They study distinguishes between the “full cost account”, which is supposed to provide a lower bound, and the “variable cost account” which is supposed to provide an upper bound of the substitution strategy (see Beicht *et al.* for a discussion). Figures 2 shows that the substitution strategy decreases by firm size according to the variable cost approach (dark bars) as well as according to our within firm retention rate classification (striped bars). In contrast, the full cost approach does not show a decreasing substitution strategy by firm size (light bars). We also find that our approach always lies between the calculated lower and upper bound of the cost benefit study, which indi-

⁹ Similar clusters are observed on factors of four and five in the respective histograms in the appendix.

cates that our results provide an adequate classification despite its simple method and comparatively low data requirements. The strong firm-size related decrease in the proportion of firms with a substitution strategy can be assumed to reflect the importance of internal labour markets in larger firms (Soskice 1994, Neubäumer and Bellmann 1999), differences in the training occupations or differences in collective agreements containing an obligation to hire firm internal apprenticeship graduates.

2.4 DETERMINANTS OF A SUBSTITUTION TRAINING STRATEGY

In the following paragraph we use our classification to study what determines whether a firm follows a substitution or an investment strategy with its apprenticeship training. We estimate the determinants of the substitution strategy in the year 2003 for which we have most observations (results however remain stable if we use other years or vary the cut off points in the classification step; detailed results for alternative estimations are given in the appendix).

The results of the 2003 regression analysis based on the above mentioned cut-off definition firstly show an increasing probability of a substitution strategy with a larger proportion of white-collar workers in comparison to the reference group of unskilled blue-collar workers.¹⁰ This can be interpreted as a consequence of typical internal labour market characteristics. Internal labour market studies show that for blue-collar workers internal labour markets are much stronger, leading to a longer tenure and a higher probability of company sponsored general training, whereas for white collar workers internal labour markets are less strong and therefore firm sponsored general training should be lower (Janssen and Pfeiffer 2009). Internal labour markets also explain why larger firms are less likely to train with a substitution strategy: with increasing firm size the probability of internal labour markets rises and, therefore, the apprenticeships as an important port of entry into the internal labour market are more likely.¹¹ This is in line with the argument of Soskice (1994) who describes the role of internal labour markets as central for the apprenticeship system, because it helps large and medium-sized companies to retain their apprentices and it provides young people with a strong incentive to strive for an apprenticeship in those companies. Larger firms can therefore attract more able adolescents, as theoretically shown by Franz and Soskice (1995). The higher immediate retention rate allows larger firms to invest in more expansive training.

¹⁰ Apprentices are not counted as employees.

¹¹ We modelled a continuous concave function of the firm size, but the maximum lies outside the observed firm size distribution.

Table 2.1: Marginal Effects of a Probit Regression.

Dependent Dummy Variable: one = substitution strategy and zero = investment strategy.

	Coefficient	Z-Value	Coefficient	Z-Value
Share of White Collar Worker	0.0939	1.62	0.0973	1.69
Share of Skilled Blue Collar Worker	0.0437	0.73	0.0427	0.72
Export Share of the Revenue	-0.0008	1.23	-0.0008	1.32
Labour Turnover	0.0430	0.29	0.0461	0.32
Log(Investment)	-0.0098	3.59	-0.0095	3.50
Works Council*	-0.0637	2.49	0.0060	0.17
Collective Bargaining Contract*	0.0286	1.25	0.0668	2.46
Interaction Works Council Collective Bargaining Contract*			-0.1059	2.42
Firm Older than 5 Years*	-0.0107	0.41	-0.0128	0.50
Foreign Owned Company*	-0.0647	1.80	-0.0569	1.57
Workforce Development in the Last Year	-0.0005	1.31	-0.0005	1.28
Company Sponsored Further Training*	-0.0759	2.01	-0.0766	2.02
Located in East Germany*	-0.2226	4.11	-0.2256	4.19
Firm Size	-0.0002	2.53	-0.0002	2.46
Firm Size Square/ 1000000	0.0103	2.89	0.0099	2.84
Regional Unemployment Rate	0.0330	5.81	0.0337	5.93
Number of Observations		1357		1357
Pseudo R ²		0.2504		0.2546
log Likelihood		-533.53		-530.5884

* Dummy variable; the regression include 13 industry dummies, all service sectors are negative and mostly significant, while the manufacturing sectors are all positive (and mostly significant). Reference category: share of unskilled blue collar workers. Source: own calculations with the IAB Establishment Panel 2003 basing on classification on the waves 1996-2005.

Thirdly, we find that service sector firms are significantly more likely to follow a substitution strategy than manufacturing firms meaning they retain on average significantly fewer apprentices over several years. This corresponds with a lower importance of internal labour markets in service sector firms (Janssen und Pfeiffer 2009) and that these firms require more general skills (Smits and Zwick 2004). This can theoretically be explained by the skill weights approach of Lazear (2003) who shows that more general bundles of skills lead to a higher probability of an external job offer (see also Geel *et al.* 2008). This causes a higher mobility of apprenticeship graduates in the service sector as a result of their more general combination of skills.¹² Basing on the skill weights approach, Geel *et al.* (2008) show that a higher mobility of apprenticeship graduates correspond with a more general combination of skills. Therefore, service sector firms are more likely requested to ensure cost neutral apprenticeship training and their apprentices have to be more productive during the apprenticeship than apprentices

¹² This paper analyses the mobility based on the companies view. Similar results of sectoral different mobility on an individual perspective are shown by Schwerdt and Bender (2003) or Franz and Zimmermann (2002).

in other sectors where the combination of acquired skills is more specific. Evidence for a higher productivity of service sector apprentices is provided by Mohrenweiser and Zwick (2009) based on six years social security panel data study. They find a higher productivity of apprentices in commercial and trade occupations in comparison to manufacturing apprentices. Thus, if the service sector becomes more important in the future, this could result in an increasing importance of the substitution strategy if nothing else changes.

Fourthly, we find that a firm's coverage by a collective bargaining agreement results in a higher (but insignificant) probability of a substitution strategy whilst a firm with a works council have a significant lower probability of a substitution strategy. This is in line with the argument that works councils raises company sponsored training expenditures using their co-determination rights on personnel matters especially the skill development (Müller-Jentsch 1995). These co-determination rights may be used to negotiate with the business management about an obligatory employment contract of apprenticeship graduates leading to a higher retention rate and this result in to a declining probability of the substitution strategy. This describes theoretically the voice function of employee representation which is widely associated with works councils operating on the company level whereas collective bargaining takes place mostly on the industry level and it is carried out by trade unions. Indeed, the interaction between works councils and collective bargaining is pronounced as the important link to understand the German system of industrial relation because works councils are more beneficial if the company is covered by a collective bargaining contract meaning that the distributional conflicts are delegated to the industry level (Hübler and Jirjahn 2003). Interestingly, an interaction term (works council and collective bargaining) enforces the pure collective bargaining effect which results now in a significant higher probability of the substitution strategy. This can be interpreted that if a company faces a collective bargaining contract which can be associated with a binding minimum wage (here especial for unskilled workers) but not a works council it uses apprentices as substitutes for unskilled workers, i.e. they do not retain their apprenticeship graduates. Otherwise, the works council itself has no effect on the training strategy as long as the company is not covered by a collective bargaining agreement which means that the distributional conflicts are not delegated to the industry level. Indeed, the coverage of a works council and a collective bargaining contract decrease the probability of a substitution strategy (interaction effect). Here, the distributional conflicts are negotiated on the industry level and the works council may now use the co-determination rights to negotiate a job offer for apprenticeship graduates and this changes the role of apprentices within a company fundamentally. These findings support the argument of Hübler and Jirjahn (2003),

who state that the interaction between works councils and collective bargaining is as fundamental as the firm size in explaining the German system of industrial relations.

Moreover, a higher capital equipment per employee leads to a lower probability of a substitution strategy indicating complementarities between physical and human capital (Franz and Soskice 1995, Acemoglu and Pischke 1999a). Another interesting result is that a higher export share which is a common measure for a firms' competitiveness does not lead to a lower probability of a substitution strategy. This indicates that a stronger competitive environment is obviously not an obstacle for training investments. Interestingly, foreign owned firms are also not more likely to follow a substitution strategy. Although, foreign owned firms have a lower probability to train apprentices, those firms obviously do not train to substitute unskilled workers with low wage apprentices. Finally, the negative relation between investment in further training and a substitution training strategy indicates complementarities between initial and further training expenditures. Additionally, we have controlled for changes in labour demand by taking into account the workforce development in the last year and the regional unemployment rate. The first makes sure that hiring of a company's own apprenticeship graduates is not a pure question of a rising labour demand. The latter controls for regional labour market differences.

2.5 CONCLUSIONS

Apprenticeship training in Germany is typically seen as an investment of companies into the human capital of their apprentices in many theoretical and empirical studies over the last decades. This view is based on the German cost benefit studies which provide evidence for substantial net costs for firms training apprentices. However, this assumption has not been confirmed by other types of data or methods so far. We show that apprenticeship training firms does not follow one homogeneous strategy. Rather, some firms follow an investment strategy and others follow a substitution strategy. We suggest an empirical method based on a detailed analysis of retention rates to distinguish between both strategies. According to our classification, we find 18.5 percent of all companies to follow a substitution strategy and 43.75 percent to follow an investment strategy; the rest is mixed or undetermined. We can further show that our classification method is in line with structural features of the available cost benefit studies; the within firm retention rate distribution is located between the full and the variable cost account estimates of Beicht *et al.* (2004). The classification based on within-firm retention rates is attractive because it is applicable in public available databases. It is well suited to

classify substitution motivated training firms but it is less precise in identifying the investment motivation. Moreover, very small firms which train only one apprentice need longer panel duration and therefore classification results are less precise for very small firms.

In a third step we estimate which firm characteristics determine a substitution strategy as defined above. We find that the probability of a firm following a substitution strategy increases with lower capital equipment, with the absence of works council, with a higher share of white collar workers and in smaller companies. We further find that service sector firms have a significantly higher probability to follow a substitution strategy than manufacturing firms and complementarities between firms' investments in initial training and firm sponsored continuing training.

Our findings complement previous empirical analyses. Previous studies about the training motivation require cost benefit data but this data can not be linked to other data sets and lack a panel dimension by construction. The within-firm retention rate allows now a suitable approximation of the training motivation in Social Security Records and the IAB Establishment Panel. The training motivation is political and scientific important because companies with a substitution strategy employ apprentices because of their lower unit labour costs and, thus, they react strongly to relative wages of apprentices. Their decisions may be in sharp contrast to the decisions taken by firms training apprentices according to an investment strategy because the latter care more about future returns and training quality rather than lower wages of apprentices. Thus we conclude that a sound analysis of apprenticeship training and its determinants firstly needs to distinguish firms training according to an investment or a substitution strategy. This classification can further be used to test theories about company sponsored general training.

APPENDIX:

Figure 2.A1: Within firm retention rate distribution of apprenticeship graduates by minimum observations increase:

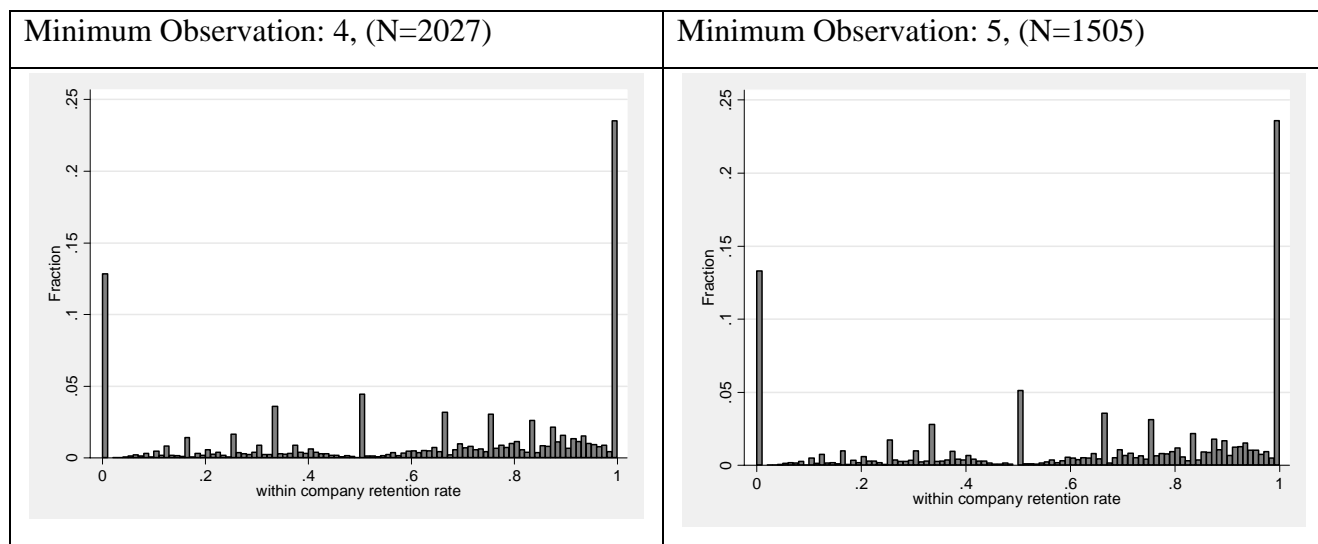


Table 2.A1: Descriptive statistics, all classified companies in 2003.

	Number of Obs.	Mean	Standard Deviation	Mini- mum	Maxi- mum
Proportion of Substitution strategy firms	1357	0.2181	0.4131	0	1
Share of White Collar Worker	1357	0.4383	0.2880	0	1
Share of Skilled Blue Collar Worker	1357	0.3987	0.2899	0	1
Export Share of the Revenue	1357	17.88	25.49	0	100
Labour Turnover	1357	0.0245	0.0544	0	0.8913
Log(Investment)	1357	6.5903	3.5041	0	14.72
Works Council*	1357	0.6308	0.4828	0	1
Collective Bargaining Contract*	1357	0.6787	0.4671	0	1
W' Council and Collective B' Contract*	1357	0.5195	0.4998	0	1
Firm Older than 5 Years*	1357	0.1496	0.3568	0	1
Foreign Owned Company*	1357	0.1120	0.3155	0	1
Workforce Development in the Last Year	1357	-4.46	47.96	-701	445
Company Sponsored Further Training*	1357	0.9285	0.2577	0	1
Located in East Germany*	1357	0.3589	0.4798	0	1
Firm Size	1357	379.16	1075.49	1	19443
Regional Unemployment Rate	1357	13.19	5.45	6.9	21.8

Table 2.A2: Descriptive statistics, substitution strategy companies in 2003.

	Number of Obs.	Mean	Standard Deviation	Mini- mum	Maxi- mum
Share of White Collar Worker	296	0.5064	0.3277	0	1
Share of Skilled Blue Collar Worker	296	0.3799	0.3277	0	1
Export Share of the Revenue	296	5.09	15.53	0	100
Labour Turnover	296	0.0329	0.0700	0	0.5714
Log(Investment)	296	4.9113	3.8336	0	12.44
Works Council*	296	0.3716	0.4841	0	1
Collective Bargaining Contract*	296	0.5912	0.4924	0	1
W' Council and Collective B' Contract*	296	0.2838	0.4516	0	1
Firm Older than 5 Years*	296	0.2264	0.4192	0	1
Foreign Owned Company*	296	0.0332	0.1795	0	1
Workforce Development in the Last Year	296	-3.86	53.83	-701	350
Company Sponsored Further Training*	296	0.8412	0.3661	0	1
Located in East Germany*	296	0.5270	0.5001	0	1
Firm Size	296	123.53	770.52	1	13080
Regional Unemployment Rate	296	15.58	5.51	6.9	21.8

Table 2.A3: Descriptive statistics, investment strategy companies in 2003.

	Number of Obs.	Mean	Standard Deviation	Mini- mum	Maxi- mum
Share of White Collar Worker	1061	0.4193	0.2731	0	1
Share of Skilled Blue Collar Worker	1061	0.4040	0.2784	0	1
Export Share of the Revenue	1061	21.45	26.56	0	100
Labour Turnover	1061	0.0222	0.0489	0	0.8913
Log(Investment)	1061	7.0587	3.2574	0	14.72
Works Council*	1061	0.7031	0.4571	0	1
Collective Bargaining Contract*	1061	0.7031	0.4571	0	1
W' Council and Collective B' Contract*	1061	0.5853	0.4929	0	1
Firm Older than 5 Years*	1061	0.1282	0.3344	0	1
Foreign Owned Company*	1061	0.1338	0.3406	0	1
Workforce Development in the Last Year	1061	-4.63	46.21	-323	445
Company Sponsored Further Training*	1061	0.9529	0.2120	0	1
Located in East Germany*	1061	0.3120	0.4635	0	1
Firm Size	1061	450.47	1136.27	2	19443
Regional Unemployment Rate	1061	12.52	5.24	6.9	21.8

Table 2.A4: Marginal Effects of Probit Regression in different years, with the same cut off point 20/80, the 2003 regression is reported in the text.

Dependent dummy variable: one = substitution strategy and zero = investment strategy.

	2001: 20/80		2003: 20/80		2005: 20/80	
	Coefficient	Z	Coefficient	Z	Coefficient	Z
Share of White Collar Worker	0.1346	2.34	0.0973	1.69	0.0885	1.33
Share of Skilled Blue Collar Worker	0.0927	1.63	0.0427	0.72	0.0478	0.71
Export Share of the Revenue	-0.0018	2.34	-0.0008	1.32	-0.0008	1.26
Labour Turnover	-0.0347	0.24	0.0461	0.32	0.0860	0.52
Log(Investment)	-0.0111	3.37	-0.0095	3.50	-0.0103	3.48
Works Council*	-0.0170	0.45	0.0060	0.17	-0.0183	0.49
Collective Bargaining Contract*	0.0617	2.31	0.0668	2.46	0.0558	2.02
Interaction W' Council Collective B' Contract*	-0.1139	2.49	-0.1059	2.42	-0.0657	1.44
Firm Older than 5 Years*	-0.0227	0.83	-0.0128	0.50	-0.0134	0.51
Foreign Owned Company*	-0.0338	0.89	-0.0569	1.57	-0.0648	1.76
Workforce Development in the Last Year	-0.0001	0.66	-0.0005	1.28	0.0004	1.10
Company Sponsored Further Training*	-0.0675	1.98	-0.0766	2.02	-0.0357	0.98
Located in East Germany*	-0.1235	2.22	-0.2256	4.19	-0.0965	2.16
Firm Size / 10	-0.0002	0.40	-0.0017	2.46	-0.0027	3.68
Firm Size Square/ 1000000	0.0004	0.44	0.0099	2.84	0.0202	4.01
Regional Unemployment Rate	0.0205	3.84	0.0337	5.93	0.0196	3.98
Number of Observations		1341		1357		1045
Pseudo R ²		0.2101		0.2546		0.2656
log Likelihood	-532.01		-530.5884		-405.42004	

* Dummy variable; including 13 industry dummies, all service sectors are negative and mostly significant, while the manufacturing sectors are all positive (and mostly significant). Reference category: share of unskilled blue collar workers. Source: IAB Establishment Panel 2003 basing on classification on the waves 1996-2005, own calculations.

Table 2.A5: Marginal Effects of Probit Regression with different cut off points in 2003, the 20/80 regression is reported in the text.

Dependent dummy variable: one = substitution strategy and zero = investment strategy.

	2003: 15/85		2003: 20/80		2003: 25/75	
	Coefficient	Z	Coefficient	Z	Coefficient	Z
Share of White Collar Worker	0.0513	1.29	0.0973	1.69	0.0738	1.33
Share of Skilled Blue Collar Worker	-0.0130	0.32	0.0427	0.72	0.0052	0.09
Export Share of the Revenue	-0.0005	1.16	-0.0008	1.32	-0.0008	1.37
Labour Turnover	0.0118	0.12	0.0461	0.32	0.0784	0.53
Log(Investment)	-0.0068	3.49	-0.0095	3.50	-0.0100	3.85
Works Council*	0.0267	1.12	0.0060	0.17	0.0122	0.37
Collective Bargaining Contract*	0.0462	2.55	0.0668	2.46	0.0477	1.77
Interaction W' Council Collective B' Contract*	-0.0705	2.24	-0.1059	2.42	-0.0899	2.19
Firm Older than 5 Years*	-0.0075	0.44	-0.0128	0.50	-0.0114	0.45
Foreign Owned Company*	-0.0405	1.58	-0.0569	1.57	-0.0489	1.40
Workforce Development in the Last Year	0.0001	0.18	-0.0005	1.28	-0.0006	1.47
Company Sponsored Further Training*	-0.0372	1.39	-0.0766	2.02	-0.1044	2.73
Located in East Germany*	-0.1584	4.16	-0.2256	4.19	-0.1890	3.51
Firm Size	-0.0003	3.35	-0.0002	2.46	-0.0002	2.79
Firm Size Square/ 10000	0.0128	3.36	0.0099	2.84	0.0124	3.17
Regional Unemployment Rate	0.0243	5.97	0.0337	5.93	0.0290	5.32
Number of Observations		1106		1357		1521
Pseudo R ²		0.3086		0.2546		0.2395
log Likelihood	-379.57		-530.5884		-620.26407	

* Dummy variable; including 13 industry dummies, all service sectors are negative and mostly significant, while the manufacturing sectors are all positive (and mostly significant). Reference category: share of unskilled blue collar workers. Source: IAB Establishment Panel 2003 basing on classification on the waves 1996-2005, own calculations.

CHAPTER 3

WHY DO FIRMS TRAIN APPRENTICES? THE NET COST PUZZLE RECONSIDERED

A shortened version is accepted for publication in Labour Economics, with Thomas Zwick

3.1. INTRODUCTION

The German dual apprenticeship system is often regarded as a potential model for other countries because it allows enterprises to provide and pay for training in specific and general human capital (Harhoff and Kane 1997, Acemoglu and Pischke 1999b, Steedman 2001). The stylised fact that companies invest in skills of their apprentices stems from an influential series of descriptive cross-section costs and benefits evaluations by the Federal Institute for Vocational Education and Training (Bundesinstitut für Berufsbildung, BIBB). Since apprenticeships are unanimously considered to partly offer general skills, the assumption of inevitable net costs during apprenticeship training is a puzzle which has motivated many theoretical studies to analyse market imperfections as a source of company-sponsored general training. Many empirical studies of the German apprenticeship system also make the assumption of net costs without testing it. While there seems to be an abundance of theoretical explanations for the stylised fact of net costs, the ‘fact’ itself has not been subjected to scrutiny, although it is one of the keys to understanding the dual apprenticeship system and to evaluating it by comparison to other training systems.

In this paper we therefore aim to reconsider the question whether German enterprises have to accept short-term disadvantages when they offer apprenticeships. In contrast to the descriptive costs and benefits evaluations we cannot directly measure the net costs of apprenticeship training during the apprenticeship period. We can, however, analyse the arguably more relevant question whether establishments that increase the share of apprentices at the cost of the share of unskilled or semi-skilled employees face a reduction in their profits and how establishment productivity is affected. Taking into account relevant factors for establishment performance and endogeneity of qualification shares as well as unobserved time-invariant establishment heterogeneity we are able to identify the causal impact.

We show that employing apprentices in trade, commercial, craft, and construction occupations instead of unskilled or semi-skilled employees has a positive impact on contemporary establishment performance. In contrast, substituting apprentices for unskilled worker in manufacturing occupations has a negative effect on contemporary establishment performance.

These results shed new light on discussions of the German apprenticeship system. Training companies accept on average short-term establishment performance disadvantages only in manufacturing occupations in order to obtain adequately trained employees. These occupations require more specific skills and have stronger internal labour markets than other occupations. In addition, skilled employees in these occupations are hard to hire on the external labour market.

The paper is structured as follows: first we present an overview of the discussion of whether establishments incur net costs during apprenticeship training (section 2). Then we describe our theoretical framework (section 3) and our estimation approach (section 4). In the fifth section we discuss our data set and in section six we present the results. The paper ends with a discussion of our results.

3.2 COSTS AND BENEFITS OF APPRENTICESHIP TRAINING

There is an extensive literature that singles out the dual apprenticeship system in Germany as an anomaly because the companies seem to pay for the provision of general human capital and they do not recoup their costs until the end of the training period (Franz and Soskice 1995; Harhoff and Kane 1997; Acemoglu and Pischke 1998; 1999b). This seems to be a puzzle because firms should only be interested in paying for specific non-transferable skills, while the apprentices should pay for general skills themselves.

Many contributions try to solve this perceived puzzle by explaining the willingness of firms to pay for general human capital by different sources of market imperfections. External firms might find it difficult to judge the quality of the training programme in other firms (Katz and Ziderman 1990, Chang and Wang 1996) or there might be asymmetric information about the productivity of apprentices (Elbaum and Singh 1995, Franz and Soskice 1995, Acemoglu and Pischke 1998). Moreover, there might be complementarities between general and firm-specific skills. General skills can be used more efficiently when the worker has some firm-specific knowledge and skills and it is possible for the training firm to get some of the returns of general training (Franz and Soskice 1995, Acemoglu and Pischke 1999a,b, Kessler and Lülfsesmann 2006). Furthermore, labour market institutions, such as minimum

wages, unions or works councils, can cause a human capital investment incentive (Acemoglu and Pischke 1999a, Dustmann and Schönberg 2009). Finally, there might be other costs for apprentices and employees when apprentices move to another employer after their apprenticeship period such as mobility costs, search costs, training on the job etc. (Harhoff and Kane 1997, Acemoglu and Pischke 1998). These contributions argue that the market imperfections allow firms to pay their own apprenticeship graduates less than the market wage for skilled workers and hereby recoup net costs incurred during the apprenticeship period (Harhoff and Kane 1997, Acemoglu and Pischke 1999a). More specifically, Acemoglu and Pischke (1999a) show that there are two conditions for the willingness of firms to pay for training: firms earn profits on workers and these profits are increasing in training level.

These theoretical contributions are all based on the stylised fact of net costs during the apprenticeship period. The net costs assumption stems from a series of descriptive cost-benefit-studies conducted by the BIBB (Bardeleben et al. 1997; Beicht et al. 2004, Wenzelmann et al. 2009). These evaluations calculate relevant costs during apprenticeship training for about 50 occupations and compare them with the economic value of the productivity contribution of a typical apprentice. Evaluations are based on surveys of about 2,500 (personnel) managers who assessed one occupation each. They consistently find that all occupations and almost all companies face sizeable net costs during the apprenticeship period.¹

There are only three related studies we are aware of which analyse the causal effect of apprentices on firm or establishment performance in multivariate approaches. Fougère and Schwerdt (2002) find a positive effect of apprentices on value added only in medium-sized German establishments. Problematic in their cross section study is that the reference qualification group is “other than unskilled and skilled workers” and therefore not specified. Askildsen and Nilsen (2005) analyse the recruitment of apprentices during the business cycle in Norway. They find that apprentices are substitutes for skilled workers and are primarily recruited in boom phases. Zwick (2007) finds on the basis of panel estimations that an increase in the share of apprentices does not decrease profits on average.

¹ This refers to the full cost account, which is usually cited in scientific publications. Please note that the net apprenticeship costs calculated in the most recent cost benefit report are clearly lower on average than in the previous reports and a substantial share of firms are shown to enjoy net surpluses from training (Wenzelmann et al. 2009).

3.3 THEORETICAL FRAMEWORK

Contrary to previous studies, we treat apprentices not as a homogenous group, but we demonstrate that differentiating between occupational groups can teach us more about the motivation of enterprises to hire apprentices. Apprenticeships differ in their expected mobility of apprenticeship graduates.² This is easily modelled by a two stage game, where the establishment trains apprentices in the first stage and can employ them in the second stage, probably taking advantage of market imperfections discussed above. However, expected mobility of apprenticeship graduates in the second stage differs between occupations because of the firm-specificity of acquired skills and internal labour markets.³ If expected mobility is low, an establishment can invest in skills of apprentices and gain by employing former apprentices in the second stage. Otherwise, an establishment is forced to exploit productive work of apprentices already in the first stage. Establishments can use both strategies.

The German apprenticeship system is characterised by a duality of training sites, which means that apprentices spend 1-2 days a week in a vocational school, and 3-4 days in the training company (Franz and Soskice 1995). The integration of apprentices in the production process is an important part of the German apprenticeship system, because companies can (partly) recoup training costs during the training period. The value of productive work and costs of apprentices in the first stage should be compared to those of unskilled workers.⁴ A potential substitutability between apprentices and unskilled or semi-skilled workers is described by Lindley (1975) and Harhoff and Kane (1997). It can be analysed within a simple micro-economic production model with two substitutable input factors (apprentices and unskilled or semi-skilled workers) where employment shares are dependent on their relative unit labour costs (Mohrenweiser and Backes-Gellner 2010).

Therefore, we aim at establishing a causal relationship between the decision of an establishment to recruit apprentices instead of unskilled or semi-skilled workers and its performance. Therefore, we use the production function framework proposed by Dearden *et al.* (2006). We divide the employees (L) in different skill and professional groups (s), where θ refers to their productivity differences:

² Different retention rates for similar groups are also shown by Büchel and Neubäumer (2001). See also footnote 4 for different retention rates in our sample.

³ Obviously, the specificity of training in the first stage drives the wage loss of employer switchers in the second stage (Geel and Backes-Gellner 2009).

⁴ A comparison of the net costs of apprentices with those of unskilled or semi-skilled workers can be interpreted as a lower bound: if apprentices are on average not as productive as unskilled workers, then companies do not employ apprentices in order to cut unit labour costs. In other words, they invest in apprentices during the training period (at least as long as wage compression is low for unskilled workers).

$$L = \sum_s (1 + \theta) L_s . \quad (3.1)$$

Then we define a reference category and multiply all summands by L/L , logarithmise, use the approximation $s \approx \ln(s+1)$ for small s , define $l_s = L_s/L$, and solve to:

$$\ln L = \ln L + \sum_s \theta_s l_s . \quad (3.2)$$

Then we insert (3.2) in a standard logarithmic Cobb Douglas function and solve this to get:

$$\ln \pi_i = A + \alpha \ln k + \beta \sum_s \theta_s l_s , \quad (3.3)$$

where π is the establishment productivity per capita, k is the capital per head and the l are the proportions of different employee or professional groups s in the company i at time t while A are other company or market characteristics. The parameters α and β are the elasticities of the Cobb Douglas function for capital and labour respectively and θ presents the productivity differences between the employee and profession groups. This analytical framework replicates the decision of personnel managers to hire an apprentice instead of an unskilled or semi-skilled employee including all other relevant employer and employee information.

This framework allows to estimate a causal relationship between the decision of an establishment to recruit apprentices instead of unskilled or semi-skilled workers and its performance. We argue that a different impact on establishment performance is caused by the expected mobility of apprenticeship graduates in certain occupations depending on specificity of skills and internal labour markets. We consider three occupational groups: manufacturing occupations, craft and construction occupations, and trade and commercial occupations. This classification is chosen so that the impact of the occupation groups on establishment performance is as homogeneous as possible.⁵

⁵ The retention rates according to our occupational groups are 72 percent in trade and commercial, 77 percent in manufacturing and 61.5 percent in construction and crafts. Note that these retention rates are slightly higher than

The first group of apprentices consists of commercial and trade occupations, which are commonly named white collar workers. White collar workers mostly acquire transferable, general skills such as languages, IT or social skills (Smits and Zwick 2004). More general skill bundles lead to a higher probability of an external job offer (Lazear 2003) and a higher mobility of apprenticeship graduates (Geel and Backes-Gellner 2009). Therefore, establishments with apprentices in commercial occupations are more likely forced to ensure that costs and benefits of apprenticeship training are not worse than hiring unskilled or semi-skilled employees. We therefore propose our first hypothesis:

HYPOTHESIS 3.1: The share of apprenticeships in commercial and trade occupations is increased at the cost of the share of unskilled or semi-skilled workers if apprentices have at least the same effect on value added and profits as unskilled or semi-skilled workers.

Second, apprentices in manufacturing occupations are generally considered to acquire a highly specific combination of skills. This reduces the transferability of skills between establishments and gives training establishments bargaining power after graduation (Soskice 1994). In addition, blue collar workers, such as manufacturing apprentices, are generally considered to face strong internal labour markets in establishments that provided their apprenticeship training. Soskice (1994) therefore describes the first skilled job after graduating in these occupations as possible ports of entry into the internal labour market. The specific skill bundles and internal labour markets result in a lower probability for apprentices to leave the training establishments. This increases incentives for companies to hire apprentices even if their cost/benefit relation is less attractive than that of unskilled or semi-skilled employees because they have a high chance to recoup investments incurred during the apprenticeship training after taking the apprentices over as skilled employees. In other words, a high retention rate of manufacturing apprentices driven by the specificity of training enables companies to invest more in training and profit from employing the graduates. Furthermore, it is not easy to find skilled employees in manufacturing occupations on the labour market and therefore establishments have to offer apprenticeship training themselves in order to be able to get new skilled employees in the future (Fougère and Schwerdt 2002). This leads to our second hypothesis:

those reported in official statistics because we restrict our sample to establishments with more than 20 employees and retention rates rise by establishment size (Mohrenweiser and Backes-Gellner 2010).

HYPOTHESIS 3.2: Apprenticeships in manufacturing occupations are also offered if the impact of apprentices on profits or value added during the apprenticeship training period is lower than that of unskilled or semi-skilled employees.

The final occupational group consists of crafts and of construction occupations. These occupations are characterised by a relatively low retention rate and a high occupational mobility after the apprenticeship (Soskice 1994). For most craft employees, switching from one employer to another is easy because most skills are not company-specific. Moreover, crafts and construction companies face a strong product market competition, which forces them to cut labour costs and hire apprentices if they have lower unit labour costs than their substitutes. Moreover, these apprentices obtain a certain productivity level rather quickly (Wolter et al. 2006).

HYPOTHESIS 3.3: The share of apprenticeships in craft and construction occupations is increased at the cost of the share of unskilled or semi-skilled workers if the apprentices have at least the same effect on value added and profits as unskilled or semi-skilled workers.

Since our theoretical considerations show strong differences between occupations, our occupational classification is not the same as the one used in the BIBB study by Beicht et al. (2004), who mainly differentiate occupations by the institutions involved (for example chambers of commerce and industry vs. chambers of crafts).

3.4 EMPIRICAL FRAMWORK

We estimate a standard Cobb Douglas Production Function including the number of employees, weighted by their occupation or skill level (Dearden et al. 2006) in order to assess the causal effect of employing apprentices instead of unskilled and semi-skilled employees on establishment performance in the three occupational groups. Rewriting (3.3), the effect is identified by the coefficients of the apprentices' occupation shares because we use the share of unskilled and semi-skilled employees as reference unit:

$$\ln \pi_{it} = \delta_1 com_{it} + \delta_2 man_{it} + \delta_3 crafts_{it} + x'_{it} \beta_i + \eta_i + u_{i,t}, \quad (3.4)$$

where t is a time indicator, i is an establishment indicator, com , man and $crafts$ are the proportion of apprentices in commercial and trade, manufacturing, crafts and constructions occupations, respectively, and δ equals to β times the respective θ .⁶ The dependent variable π measures the establishment performance per capita and x is a column vector of other covariates. Finally, η denotes unobservable time-invariant factors and u stands for the normally distributed error term.

Our estimation procedure takes into account different sources of estimation bias or endogeneity problems such as selectivity, unobserved time-invariant heterogeneity and simultaneity. In order to assess changes incurred by estimation biases, and as a benchmark, we start with a pooled OLS estimation, i.e., a cross-section, which treats observations of an establishment from different years as independent.

We control for time-invariant unobserved variables influencing both establishment performance and share of apprentices (unobserved establishment heterogeneity: $E(x, \eta) \neq 0$) by estimating the model in first differences or by demeaning the cross-section equations. Unobserved heterogeneity causes an upward-bias when good industrial relations or good personnel management lead to better establishment performance on the one hand and to higher apprenticeship training endeavours on the other. This estimation explains the change in establishment performance from one year to the next by means of a change in the composition of employee qualifications and other covariates, or in other words we switch from a between establishments to a within establishments analysis.

The fixed effects results can still be biased either positively or negatively. The source of this estimation bias is endogeneity of the share of apprentices. First, establishments may alter their qualification structure and their performance simultaneously and both may be influenced by exogenous shocks. For example, simultaneity can induce a downward bias if relatively low establishment performance is a signal for a structural labour costs problem, which establishments might try to solve by substituting apprentices for unskilled workers. Otherwise, positive demand shocks induce an upward bias if they lead establishments to increase the number of apprentices in order to satisfy their future skilled labour needs. Another source of estimation bias is selectivity in apprentice training (Wolter et al. 2006). These three sources of esti-

⁶ The list of occupations in the three groups can be found in Appendix Table 3.A5.

mation bias are replaced in our third estimation specification by an instrumental variable panel regression. It is convenient, in this respect, to use general method of moments (GMM) estimation with internal instruments. Since lagged internal instruments do not pose causality problems, contemporary external instruments might have given the assumptions stated below. More precisely, we prefer the System GMM Estimator, which instruments the first differences of explanatory variables with corresponding levels of lagged variables and the levels are simultaneously instrumented by adequate lagged differences. Potentially endogenous variables need the lags $t-2$ and predetermined ones the lags $t-1$ (Blundell and Bond 1998). We therefore need at least four time periods, where the fourth lag is the instrument. The main advantage of this approach is that besides temporary differences, differences in levels between establishments are also taken into account. This improves information used in identifying the effect and usually enhances the precision of the estimator. Therefore, we first make the so-called sequential exogeneity assumption ($E(x_{i,t}, \Delta u_{i,t-1}) = 0 = E(x_{i,t}, u_{i,t-1} - u_{i,t-2})$), which means that contemporary exogenous shocks have no impact on lagged explanatory variables. A second necessary condition is that correlations between unobserved fixed effects and first differences of covariates remain constant over time.⁷ In our investigation this means, for example, that personnel management or industrial relations do not change much over the analysed time period of six years.

The estimations are carried out with the help of a two-step method under the application of Windmeijer's adjustment process for variances (Windmeijer 2005), using the command `xtabond2` in STATA 9.2 (Roodman 2006). In addition, we impose common factor restrictions using a minimum distance estimator in order to obtain a single coefficient for all covariates in the dynamic model (Blundell and Bond 1998).⁸

We can identify the effect of changes in the proportion of occupational groups of apprentices on establishment performance because of adjustment costs and strict labour market regulation. First, dismissal protection allows establishments to directly affect their share of apprentices, but shrinking establishments may face an inefficient composition of staff because employees cannot be replaced and laid off at will. Second, there may be a lack of suitably skilled job applicants. As a consequence, some establishments might not have their optimal employee mix and an increase in the share of a particular employee group would influence establishment performance.

⁷ This is also called the stationarity assumption.

⁸ The DPD package of the System GMM estimator displays both results but it is not included in the STATA version.

3.5 DATA

Our data are taken from the waves 1997-2002 of the linked employer-employee data set of the IAB (LIAB). The LIAB combines Federal Employment Agency individual-based employment statistics with plant-level data from the IAB Establishment Panel. The distinctive feature of the LIAB is the combination of administrative information on individuals and details concerning establishments that employ those (Jacobebbinghaus 2008).

The information on the schooling level of employees in the employment statistics may be inconsistent because the information is not obligatory. Therefore we use the correction method proposed by Fitzenberger et al. (2006). One performance measure is gross profits. In order to calculate gross profits, we deduct the total wage bill and the share of inputs from revenues. For the calculation of the wage bill we have to take into account that roughly 11 per cent of the sample is top coded at the earnings ceiling for social security contributions. We therefore impute wages for those employees at the censored level. To this end, we first create 20 cells differentiated by gender, education (the six schooling groups identified in Appendix Table 3.A1) and nationality (German vs. non-German), and run censored wage regressions for each cell. The covariates comprise age, age squared, and dummies for job characteristics. Further, our procedure takes into account that the level at which wages are top coded differs between eastern and western Germany and is adjusted every year. Predicted wages for each censored observation are then calculated and imputed for each individual.

All labour-related variables are calculated from the reliable individual Social Security Records and all establishment-related variables are compiled from the IAB Establishment Panel. We use the so-called longitudinal version of the LIAB in order to be able to derive unbiased indicators of yearly means of our apprenticeship occupation groups.⁹

We exclude not-for-profit organisations, agriculture and mining establishments, as well as establishments that do not report sales (such as banks and insurance companies). We also exclude establishments with fewer than 20 employees¹⁰ and any establishments that have more than 60 per cent apprentices in their workforce. In addition, only individuals aged between 16 and 64 years and covered by social security are included in the sample. We also

⁹ In Jacobebbinghaus et al. (2008), we show that apprenticeship shares are particularly low at the point in time when the cross section LIAB is measured (June 30th each year) – and more importantly that the differences between the proper yearly average and the apprenticeship share on June 30th differs between occupation groups (e.g. three year training for most commercial and trade occupations and three and a half year for manufacturing occupations).

¹⁰ This excludes the group of firms for which the calculated net costs are near to zero (Beicht et al. 2004).

omit all employees with wages lower than the minimum income limit for compulsory social insurance, and apprentices who earned more than the social security contribution ceiling. Matching selected employees to establishments results in a sample of 1879 establishments.

Our establishment performance variable is on the one hand gross profit per capita. On the other hand, establishment performance is measured by productivity per head, calculated by an establishment's revenue minus inputs. As we do not have a variable directly indicating capital and capital costs in the panel, we can only include investments as a control variable proxy, using the perpetual inventory method (Zwick 2004). We assume that using aggregated investments instead of capital is innocuous, especially in the estimation specifications based on differences, because it seems improbable that capital costs vary with the proportion of apprentices employed. Investments, gross profits, value added and employee characteristics are divided by the number of employees in order to avoid having to measure scale effects such as a positive correlation between levels of investments and profits. Further, we take logs on investments, value added and gross profits in order to reduce the potential impact of outliers.

3.6 FINDINGS

Our three occupational groups cover 85 per cent of all apprentices. More specifically, commercial and trade occupations cover 25 per cent, crafts and construction occupations 30 per cent and manufacturing occupations 30 per cent of all apprentices. The entire summary statistics on establishment (mean) characteristics for the estimation sample used for the System GMM regressions are given in Table 3.A1 in the appendix.

In a first step, we analyse the impact of apprentices on gross profits in the three occupational groups in comparison to semi- and unskilled workers. Afterwards, this is compared with the relative effect of apprentices on productivity. The differences show us whether apprentices are attractive because they increase productivity or merely because they have lower wages.

Our pooled OLS estimation in Table 3.1 suggests that the contribution of apprentices to gross profits in commercial and trade occupations is significantly positive in comparison to that of unskilled or semi-skilled workers. In contrast, the contribution of crafts and construction apprentices, as well as that of manufacturing apprentices, is significantly negatively correlated with the gross profit. All further covariates have expected signs (see Table 3.A2 in the appendix): higher investments per capita, presence of works councils, collective bargaining, and export share are positively correlated with gross profits. The share of employees with a lower

than tertiary-level qualification has a negative correlation, while the share of employees with a higher qualification is positively correlated with gross profits.

If we accept the OLS estimates, our results would imply that an increase in the share of apprentices in commercial or trade occupations at the cost of unskilled workers increases gross profits by almost two percentage points. The analogous figures are a decrease by more than a half percentage point for the other two apprentice occupation groups. These are non-negligible figures. The pooled regression is possibly biased, however, because observations of the same establishment in different years are considered as independent, and endogeneity cannot be taken into account. The Fixed Effects Regression (FEM) that accounts for time-invariant unobserved heterogeneity has a smaller number of significant coefficients. The contribution of all apprentice groups to establishment performance is now insignificant.

In order to tackle endogeneity, we prefer a System GMM approach with lagged levels and lagged differences, respectively, as internal instruments and the lagged endogenous variable as explanatory variable. More specifically, we treat worker-related variables as potentially endogenous (apprentices' occupation and job characteristics – see appendix) and instrument them with lags (t-2) and all further available lags. The investment variable is seen as predetermined and is instrumented with lag (t-1) and further lags. All establishment-related variables are seen as exogenous (works councils, industry and so on, see appendix). The System GMM Estimation is reported in Table 3.A3 in the appendix. All test statistics confirm our specification (autocorrelation tests and test of over-identification restrictions). Taking endogeneity into account shows that apprentices in commercial and trade occupations have a higher positive impact on gross profits than unskilled and semi-skilled workers, according to Hypothesis 3.1. In detail, a one per cent increase in the proportion of commercial apprentices raises contemporary gross profits by around one per cent. The apprentices in commercial and trade occupations are obviously on average sufficiently productive and receive sufficiently low wages so that their unit labour costs make them as attractive as semi-skilled or unskilled employees during the training period. In accordance with our second hypothesis, the contribution of manufacturing apprentices to establishments' gross profits is negative in comparison to unskilled workers. These apprenticeships therefore impose a burden on establishments during the training period, and their benefits have to come from employing own apprenticeship graduates. Further, apprentices in craft and construction occupations have a significantly more beneficial impact on gross profits than unskilled workers, which confirms our third hypothesis. The employment of these apprentices is more beneficial than employing unskilled workers.

Table 3.1: Gross profit estimation, dependent variable: log(value added minus total wage bill per capita), productivity estimation, dependent variable log(value added)

	OLS	FEM	Sys GMM	
	Gross Profits	Gross Profits	Gross Profits	Productivity
<i>Share of Apprentices in:</i>				
Commercial or Trade Occ.	1.810 * (7.26)	-0.385 (0.99)	0.995 * (2.57)	2.210 * (3.63)
Manufacturing Occ.	-0.732 * (3.63)	-0.236 (0.69)	-1.165 * (2.51)	-0.043 (0.07)
Crafts or Constructions Occ.	-0.767 * (4.06)	0.227 (0.62)	1.376 * (3.58)	1.446 * (2.36)
Number of Establishments	8169	2146	1879	1879
R ² / Number of Instruments	0.1710	0.0186	288	288

Comments: t-values in parenthesis. Full output in the Appendix Tables 3.A2-3.A4, reference category: share of unskilled workers. * significant on the 5 percent level.

Source: LIAB waves 1997–2002.

In contrast to manufacturing occupations, training establishments do not need to take over apprenticeship graduates in these occupations. Finally, the lagged endogenous variable and the proportion of skilled employees have a significantly positive impact on gross profits, while the proportion of part-time employees and the size of investments per capita have no impact. Exporting establishments and establishments with works councils have higher gross profits, establishments in East Germany have a lower productivity (see Table 3.A3).

The effect on gross profit is the relevant reason to increase the share of apprentices at the cost of the share of unskilled workers. We cannot infer, however, whether this effect stems from relative productivity or from the wages of apprentices. In order to disentangle both effects, we additionally estimate productivity regressions (Table 3.1 and Appendix Tables 3.A2-3.A4). Comparing both parts of the tables suggests that usually the impact on productivity is more positive (or less negative) than the impact on gross profit. This means that commercial apprentices are more productive than unskilled workers (given their productive working time), but their relatively higher training wages reduce the benefits. Nevertheless, apprentices still have more favourable unit labour costs than unskilled or semi-skilled workers. Another possible interpretation is that the costs of an increase in the proportion of apprentices are higher than those of an increase in the proportion of unskilled or semi-skilled employees, where one has to take the salary costs for supervisors into account. The additional supervisor costs are

smallest in craft and construction occupations (Beicht et al. 2004). In these occupations, gross profit impact is only slightly lower than that of productivity.¹¹

In order to check the robustness of our results, we also calculate everything in deviations from sector means. This slightly changes the interpretation because we cancel out level effects between sectors. Now the question is whether a higher-than-average share of apprentices in certain occupations in the sector goes hand in hand with a higher gross profit than the sector average. The results are very similar to those presented before and therefore we do not display them separately here. Furthermore, we run all regressions for those establishments that offer apprenticeships only. This does not change the results significantly, either. This is a consequence of our within enterprise identification strategy whereby non-training establishments have no additionally explanatory power. Finally, we run all regressions for the average apprenticeship share instead of differentiating between occupations groups. We obtain a result analogous to that found by Zwick (2007): increasing the share of apprentices at the cost of unskilled and semi-skilled employees does not have an impact on gross profits (and productivity).

3.7 CONCLUSIONS

This paper presents the first causal assessments of the impact of different occupational groups of apprentices on enterprise performance. It shows that it is necessary to discriminate between different groups of occupations when assessing the motivation of enterprises to train apprentices. In particular, we find that employing apprentices in trade, commerce, craft, and construction occupations instead of unskilled and semi-skilled employees has a positive impact on contemporary gross profits. In contrast, an increase in the share of apprentices in the manufacturing occupations reduces contemporary gross profits. This means that enterprises offering apprenticeships in manufacturing occupations accept a lower performance during the apprenticeship period in comparison to hiring unskilled or semi-skilled employees.

Our findings shed a new light on the stylised fact based on descriptive cross-section analyses that almost all training enterprises necessarily incur net costs during apprenticeship training. Our results are compatible with these findings if on average unskilled and semi-skilled employees have higher marginal wages than productivity in activities for which apprentices in commercial and trading as well as in construction and craft occupations can be hired. We argue, however, that the absolute level of measurable costs and benefits during apprenticeship

¹¹ A test of equality of the coefficients is rejected.

training is less important for the decision on the share of apprentices than their marginal contribution in relation to substitutes (unskilled or semi-skilled employees). Our approach therefore imitates the decision process of personnel managers on the share of apprentices in different occupations and takes into account unobserved heterogeneity between establishments and endogeneity of the qualification structure.

This paper demonstrates the operation of the German apprenticeship system: companies train skills in manufacturing occupations at a cost if apprentices stay more likely in the training establishment, the human capital acquired is relatively specific, and it is difficult to hire adequately skilled employees elsewhere. Otherwise, they offer apprenticeships in occupations with more general skills and higher between-establishment mobility only if apprentices are at least as attractive as the employment of suitable substitutes such as unskilled or semi-skilled employees.

APPENDIX

Table 3.A1: Descriptive Statistics (means at establishment level)

	Mean	S.D.
<i>Dependent variables:</i>		
Log(Value Added per Capita)	11.2463	0.5490
Log(Gross Profits per Capita)	10.7928	0.8851
<i>Distribution by Apprentices Occupation:</i>		
Commercial and Trade	0.0110	0.0246
Manufacturing	0.0146	0.0315
Crafts and Construction	0.0110	0.0341
Other	0.0080	0.0235
<i>Distribution by Job Characteristics:</i>		
Share of Apprentices	0.0445	0.0517
Share of Unskilled Workers	0.1776	0.2370
Share of Skilled Workers	0.7116	0.2551
Share of Part Time Workers	0.0637	0.1422
Share of Others	0.0025	0.0119
<i>Distribution by Schooling Level:</i>		
Share without a Completed Apprenticeship	0.1081	0.1232
Share with a Completed Apprenticeship and with a Secondary School Degree	0.7099	0.1883
Share without a Completed Apprenticeship and with Higher Education Entrance Certificate	0.0412	0.0662
Share with a Completed Apprenticeship and with Higher Education Entrance Certificate	0.0346	0.0446
Share with a Polytechnic Degree	0.0488	0.0662
Share with a University Degree	0.0574	0.0960
Share of Workers, Older than 55	0.0962	0.0672
Share of Foreigners	0.0369	0.0793
<i>Establishment Characteristics:</i>		
Log(Investment per Capita)	12.6168	2.4377
Establishment founded during last 5 Years	0.0644	0.2455
Dummy: Exporting Establishment	0.3913	0.4881
Dummy: Works Council	0.5747	0.4944
Dummy: Collective Bargaining Contract	0.6503	0.4769
Dummy: Located in East Germany	0.6131	0.4871

Table 3.A1 continued:

Distribution by Establishment Size:		
20-100	0.5881	0.4922
101 - 500	0.3245	0.4682
>500	0.0874	0.2824
Number of Establishments	5916	

* Profit per capita and investment per capita are added with a constant - the largest negative number found in the variables - to make sure that all values are positive and hence can be logarithmised.

** Full time workers can be divided in different job characteristics but not part time workers.

Source: LIAB Wave 1997 – 2002, sample used for System GMM regressions, see Tables 3.A4 and 3.A5.

Table 3.A2: OLS Estimations

	Productivity		Gross Profit	
	Coef.	t-Value	Coef.	t-Value
<i>Share of Apprentice Occupation Group (Ref.: Unskilled Workers):</i>				
Commercial and Trade	2.1780	5.63	1.8105	7.26
Manufacturing	-1.1139	-3.56	-0.7326	-3.63
Crafts and Construction	-1.5074	-5.14	-0.7671	-4.06
<i>Further Job Characteristics (Ref: Unskilled Workers):</i>				
Share of Skilled Workers	0.0778	1.57	0.0195	0.61
Share of Part Time Workers	-0.1418	-1.86	0.0879	1.79
<i>Schooling Level (Ref.: without Completed Apprenticeship and with Tertiary School Degree):</i>				
Share without a Completed Apprenticeship	-0.3514	-2.77	-0.1472	-1.80
Share with a Completed Apprenticeship and with a Secondary School Degree	-0.2521	-2.87	-0.0932	-1.65
Share without a Completed Apprenticeship and with Higher Education Entrance Certificate	1.4827	6.88	0.9374	6.75
Share with a Completed Apprenticeship and with Higher Education Entrance Certificate	0.4683	2.71	0.2395	2.15
Share with a Polytechnic Degree	0.7379	5.21	0.2814	3.08
Share of Workers, Older than 55	-0.6003	-4.41	-0.4142	-4.71
Share of Foreigners	-0.2081	-1.40	-0.1909	-2.00
<i>Establishment Characteristics:</i>				
Log(Investment per Capita)	0.0797	18.19	0.0485	17.18
Establishment founded during last 5 Years	0.0296	0.91	0.0366	1.75
Dummy: Exporting Establishment	0.1476	6.15	0.0755	4.88
Dummy: Works Council	0.2186	9.73	0.0815	5.62
Dummy: Collective Bargaining Contract	0.0500	2.33	0.0225	1.63
Dummy: Located in East Germany	-0.4496	-19.13	-0.1791	-11.82
R2	0.2415		0.171	
F (39, 8129)	66.38		42.99	
Number of Establishments	8169		8169	

Notes: Regressions also include 2 firm size dummies, 11 industry, 1 dummy for employees with unknown occupational qualification, 1 dummy for apprentices with other occupations, and 5 year dummies. Productivity: log(value added per capita), Gross Profits: log(value added minus total wage bill per capita).

Source: LIAB 1997-2002

Table 3.A3: System GMM Estimations

	Productivity		Gross Profits	
	Coef.	t-Value	Coef.	t-Value
L1 (y)	0.4645	9.99	0.4921	9.36
<i>Share of Apprentice Occupation Group (Ref.: Unskilled Workers):</i>				
Commercial and Trade	3.6501	1.85	2.6991	2.09
L1	-1.7284	-1.32	-0.7956	-1.01
Manufacturing	0.1115	0.05	-0.2360	-0.17
L1	-0.1800	-0.09	0.4902	0.38
Crafts and Construction	-0.4419	-0.24	0.2117	0.19
L1	-0.8977	-0.50	-0.8303	-0.82
<i>Further Job Characteristics (Ref: Unskilled Workers):</i>				
Share of Skilled Workers	0.7127	1.24	0.1543	0.41
L1	-0.5903	-1.13	-0.1726	-0.49
Share of Part Time Workers	1.6057	1.67	0.5583	0.97
L1	-1.1382	-1.16	-0.2430	-0.41
<i>Schooling Level (Ref.: without Completed Apprenticeship and with Tertiary School Degree):</i>				
Share without a Completed Apprenticeship	0.2183	0.40	0.1612	0.47
Share with a Completed Apprenticeship and with a Secondary School Degree	-0.1690	-0.45	-0.0321	-0.15
Share without a Completed Apprenticeship and with Higher Education Entrance Certificate	1.8793	2.03	1.3738	2.17
Share with a Completed Apprenticeship and with Higher Education Entrance Certificate	1.4316	1.77	0.9485	1.58
Share with a Polytechnic Degree	-0.1444	-0.22	-0.3942	-0.95
Share of Workers, Older than 55	0.1869	0.43	0.0658	0.22
Share of Foreigners	-0.7441	-0.96	-0.3717	-0.70
<i>Establishment Characteristics:</i>				
Log(Investment per Capita)	0.0120	0.44	0.0090	0.54
L1	0.0104	0.39	-0.0006	-0.04
Establishment founded during last 5 Years	0.0408	1.12	0.0253	1.10
Dummy: Exporting Establishment	0.0767	2.31	0.0443	2.12

Table 3.A3 continued

Dummy: Works Council	0.0839	2.65	0.0296	1.52
Dummy: Collective Bargaining Contract	0.0306	1.27	0.0077	0.53
Dummy: Located in East Germany	-0.2284	-2.79	-0.0590	-1.19
Number of Establishments	1879		1879	
Number of Instruments	288		288	
Wald chi2(47)	1365.70		876.10	
Arellano-Bond Test for AR(1) in First Differences (p-Value)	0.00		0.00	
Arellano-Bond Test for AR(2) in First Differences (p-Value)	0.53		0.77	
Hansen Test of Overidentification Restrictions (p-Value)	0.13		0.08	

Notes: see Table 3.A2. The variable y is the dependent variable, i.e., productivity or gross profits.

Table 3.A4: Minimum Distance Estimators after System GMM

	Productivity		Gross Profits	
	Coef.	t-Value	Coef.	t-Value
L1 (y)	0.4280	11.02	0.4773	10.35
Share of Apprentice Occupation Group (Ref.: Unskilled Workers):				
Commercial and Trade	2.2102	3.63	0.9952	2.57
Manufacturing	-0.0434	-0.07	-1.1659	-2.51
Crafts and Construction	1.4465	2.36	1.3762	3.58
Further Job Characteristics (Ref: Unskilled Workers):				
Share of Skilled Workers	0.9439	5.16	0.2757	2.35
Share of Part Time Workers	1.6006	4.78	0.2266	1.12
Log(Investment per Capita)	-0.0133	-1.11	0.0032	0.40

Notes: Only variables displayed which include contemporary and lagged variables. The variable y is the dependent variable, i.e., productivity or gross profits.

Table 3.A5: List of Occupational Categories

	Number of occupation in IABS
Commercial and Trade	681-706,751-773,781-784,856,922
Manufacturing	141-162,191-291,311-323,541-543,547,631-634,744,857
Crafts and Construction	53,121-135,163-177,302-306,391-422,441-514,544-546,741-744,804,901-921,923-937

Note: the plain text of the selected occupations can be found in Jacobebbinghaus (2008).

CHAPTER 4

POACHING AND APPRENTICESHIP TRAINING: AN EMPIRICAL ASSESSMENT

Unpublished working paper, with Uschi Backes-Gellner and Thomas Zwick

4.1 INTRODUCTION

Human capital is one of the key determinants of firms' productivity and innovativeness (Black and Lynch 1996, Zwick 2005, Dearden et al. 2006). Skill upgrading, hiring skilled workers and training new recruits are therefore important decisions for the competitiveness of each company. Costs of skill upgrading and training are mostly paid by employers independently of whether the accumulated skills can be transferred to other employers (Bassanini et al. 2007, Brunello and DePaola 2009). Company-sponsored training investments in transferable skills indeed induce the possibility of positive externalities to other firms when freshly trained workers are poached from the training firm. The poaching firm can satisfy its skill demand without own training investments and the poached firm might lose (part of) its training investments. Poaching therefore can lead to an under-investment in training because firms are hesitant to pay for the acquisition of skills for workers that leave before the training investments are paid-off. Under-investment in training undermines the competitiveness of companies and is of major concern for managers and politicians. Therefore, an important theoretical literature strand has developed that tries to explain the determinants of poaching (Lazear 1986, Cahuc et al. 1990) and the consequences of poaching for training investments (Stevens 1994, 1996, 2001, Booth and Snower 1995, Acemoglu 1997, Moen and Rosen 2004, Leuven 2005, Lazear 2009).

Existence, extent and determinants of poaching, however, remain an empirical question which is not analysed so far (Pischke 2007, Brunello and DePaola 2009). Measuring poaching is an empirical challenge because ideally we need to know first which firm attracts employees against the will of the training firm and second which of those employees have been costly trained. In available data sets, we usually do not know exactly the costs and benefits of training, the time lag between continuing training and departure or to what extent training

rents are shared between employer and employees (Pischke 2007). Moreover, a poaching analysis requires linked employer/employee panel data because it is based on characteristics of employees who switch their job combined with information of the training and poaching firm.

We address the empirical identification of costly trained departures induced by poaching by focusing on apprenticeship graduates. Apprentices are particularly appropriate for poaching analyses because apprenticeships are a company-sponsored training investment in observable and transferable skills. In particular, the Vocational Training Act determines the skills and final exams requirements in each training occupation and we have an indication which occupations require higher training investments than others (Beicht et al. 2004, Mohrenweiser and Zwick 2009). Further, employment of apprenticeship graduates is not contractible since apprenticeships legally terminate at the day after the last exam (non-enforceable contract) so that a new employment contract has to be signed (Soskice 1994, Franz and Soskice 1995, Harhoff and Kane 1997, Acemoglu and Pischke 1998, Ryan 2001, Culpepper 2003, Smits 2007, Dustmann and Schönberg 2009,). Moreover, employees who just graduated from an apprenticeship in a certain occupation are a relatively homogeneous group and therefore differences between earnings of those taken over by the training firm and those coming from another training firm are a good indicator whether the apprentice was attracted by a better wage offer or triggered by not getting an offer from the training firm. Finally, apprentices, apprenticeship graduates and the characteristics of the firms that trained them and the firms that poached them can clearly be identified in individual social security records linked to establishment-level data.

We evaluate the determinants of poaching by analysing firms that recruit apprenticeship graduates trained elsewhere and training firms which lose these workers. Recruiting freshly trained workers reveals a positive externality to the recruiting firm when it can earn a rent on these skilled employees. This is the case when a switching and costly trained apprenticeship graduate, is an investment loss for the training firm. Training companies which have invested in training but cannot keep their trained employees may eventually train a lower number of trainees or reduce the quality of training. We show that poached companies fail to credibly offer long-term contracts and, that companies offering long-term contracts can attract apprenticeship graduates trained elsewhere. Moreover, poaching companies more likely train apprentices themselves. Non-training companies fail to effectively recruit freshly trained apprenticeship graduates. This may be an indicator for a segmented labour market where

training and non-training companies recruit differently. Our results characterise for the first time poached and poaching establishments with a focus on apprenticeship training.

The remainder of this paper is organised as follows: The next section reviews the poaching literature, derives hypotheses and describes our empirical design. Then, we describe our data, variables, empirical strategy and present our findings. The last section concludes.

4.2 Background Discussion

Poaching Models. Theoretical models of company sponsored training investments define poaching differently (see Stevens 2001 for a discussion). This paper defines poaching when the poaching firm hires freshly trained workers instead of training these employees itself and the training company would like to keep the trained employee and loses some training investment costs (Acemoglu and Pischke 1999).¹

Poaching can take place when firms invest in the human capital of their employees and the future employment is ex-ante non-contractible so that a hold-up problem arises. Moreover, the future employer rewards the newly acquired skills and pays a higher salary than the training company, e.g. training in transferable skills (Stevens 2001, Leuven 2005, Pischke 2007).

Transferability of skills, e.g. the degree of applicability in outside firms, is a precondition for poaching (Stevens 1996, 2001). Stevens points out that poaching exist for transferable skills but it does not exist either for purely general or specific skills. The degree of transferability drives the probability of separation and the training investment by the firm. Contrary, Kessler and Lülfselmann (2006) argue when general and specific human capital are complements from the firm's point of view poaching takes only place when sufficiently general human capital is acquired, because specific skills create a wedge between workers' productivity in the training and outside firm. Similarly, Lazear (2009) argues that each skill is general but the combination of skills makes them specific for a company. Hence, poaching is not a problem as long as a bundle of general skills is more valuable in the training than in any other firm and the training firm can pay a higher salary because it rewards the whole skill bundle whereas the poaching firm would only reward some of them. In addition, skills also have to be observable by outsider firms (Lazear 1986). Visibility and transparency of skills increase the probability of an outside offer.

¹ A somewhat weaker definition defines poaching when training is lower than the social optimum (Stevens 1994, 1996, Moen and Rosen 2004). This definition is more appropriate to study the efficiency of training provided in an economy.

Several contributions discuss mechanisms which can prevent poaching. Although training is transferable and other firms would offer higher wages, Moen and Rosen (2004) show that poaching is less severe or even non-existent when the training firm gets a reputation for rewarding skill collection and credibly offers long-term contracts. Training investments may be considered as a commitment device which reduces turnover. In addition, employees might prefer to stay with their training firms although they obtain a higher wage offer from a rivalling firm (Sadowski 1980, Moen and Rosen 2004).

Similarly, Cahuc et al. (1990) argue that firms with internal labour markets can keep their employees as they wish and hire freshly skilled employees from other firms because they offer superior labour contracts and employees prefer those contracts. Moreover, they split firms with training investments into those that poach (they call them dominating firms) and those which lose some of their trained workers although they incur a loss by that (the so-called dominated firms). They show that poaching does not necessarily replace own training efforts.

Taken together, poaching implies non-contractible future employment, investment in transferable skills which are observable by outsiders. However, the reputation of the training firm to credibly offer long-term contracts can solve the poaching externality.

Empirical Design. In addition to the theoretical preconditions, an empirical framework for analysing poaching requires a unique definition of training across firms. An appropriate framework is apprenticeship training.

First, apprenticeships offer a consistent definition of training across companies because training has to follow a prescribed curriculum which is laid down in the Vocational Training Act. The Vocational Training Act describes necessary equipment and requirements which have to be fulfilled to train apprentices adequately and the (minimum) skills which have to be trained in each training occupation. Moreover, apprentices get a graded skill certificate at the end of the training period. The observance of these guidelines and the final exam is monitored by the chambers of industry and craft (Franz and Soskice 1995, Acemoglu and Pischke 1998). Second, these training regulations further imply that training is observable by outsider firms. Third, the skills are not only observable but also transferable due to the institutional arrangements which severely limit firms' ability to structure apprenticeship training so that it involves mostly firm-specific training. Fourth, future employment of apprenticeship graduates is non-contractible. Apprenticeship training contracts legally terminate at the day after the

final exam and employment has to be negotiated at the end of the training. Fifth, apprenticeships are a training investment for a part of the training companies. Training firms in blue-collar occupations in manufacturing generally invest in their apprentices whereas training firms in white-collar occupations recoup the training costs until the end of the apprenticeship due to the productive work of the apprentices (Mohrenweiser and Zwick 2009, Wenzelmann et al. 2009). Sixth, skilled employees starting their first job are a relatively homogeneous crowd. Thus, we can compare the general market wage of skilled job starters directly after finishing their apprenticeship training with the wage of employer switchers (Göggel and Zwick 2009). To identify poached skilled employees, we define them as those employees who switch employers and obtain a higher wage than the market wage for job starters in their occupation. Those job starters who get the market wage or less than the market wage might be former apprentices who did not get an offer from their training firm and they are, therefore, not poached. Seventh, we observe whether a skilled job starter changes his or her occupation. We argue that those who change their occupation can not be classified as poached employees because the new employer's capacity to acquire rents from previous training investments is small.

Taken together, apprentices receive a broadly accepted, visible and transparent training certificate at the end of their training period that makes them flexible in accepting a skilled job in either their training company or another company. Firms have to attract apprenticeship graduates either to stay or to switch. Moreover, apprentices and apprenticeship graduates are easy to identify in linked employer employee datasets where we can follow apprenticeship graduates switching employers and identify characteristics of the training and poaching firm. Furthermore, information asymmetries between potential recruiting firms may play a minor role because it is not convincing to believe that companies with and without union coverage for instance have different information about potential recruits. To the contrary, both types of firms have an expectation about the average ability of apprenticeship graduates based on the signal an apprenticeship degree in a certain occupation conveys (Heckman *et al.* 1994) on long-term occupational retention rates.

4.3 Data, Variables and Empirical Strategy

Data. We use the longitudinal version 2 of the linked employer-employee data set of the IAB (LIAB). The LIAB combines Federal Employment Agency individual-based employment statistics with plant-level data from the IAB Establishment Panel. The distinctive feature of

the LIAB is the combination of administrative information on individuals and details concerning establishments that employ those. The longitudinal version of the LIAB comprises all establishments with three consecutive observations in the IAB Establishment Panel between 1999 and 2002 and all employees who worked at least one day in those establishments between 1997 and 2003. For every employee, the data report the complete employment history since 1993 (Jacobebbinghaus 2008).

The LIAB longitudinal data are particularly suited for our analysis because the employment history is available as spell-data. The spell-data allow a day-based calculation of every recruitment, lay-off and status change (occupation change, apprentices to skilled worker) in those establishments, and the exact calculation of employment and unemployment duration of every individual.

We recalculate tenure and experience for each employee summing only employment days subjected to social insurance contribution after the apprenticeship (or internship for university graduates). Moreover, the information on the schooling level of employees in the employment statistics may be inconsistent because the information is not obligatory. Therefore we use the correction method proposed by Fitzenberger et al. (2006). We restrict the data to spells after 1998 because we cannot distinguish apprentices from interneers before 1999 (Jacobebbinghaus et al. 2009). In addition, we include only individuals aged between 16 and 64 years which are covered by social security and we exclude not-for-profit organisations, agriculture and mining establishments. Further, all labour-related variables are calculated from the individual social security records and all establishment-related variables are compiled from the IAB Establishment Panel. We match growth data downloaded from the Federal Statistical Office. Matching selected employees to their establishments results in a sample of 6572 establishments with 16937 observations.

Variables. We analyse the determinants of poaching and poached establishments. Poached establishments are identified by the within-firm retention rate, defined as the proportion of apprenticeship graduates staying in the training establishment on all apprenticeship graduates. This variable captures the proportion of apprenticeship graduates attracted by the training firm. Moreover, we calculate the proportion of internal recruits, e.g. the proportion of own apprenticeship graduates on all newly hired workers holding an apprenticeship degree. This variable additionally measures whether training companies can meet their own demand of skilled workers with own apprentices.

Poaching apprenticeship graduates is measured with three variables. The first variable measures the proportion of poaching on new recruits, defined as the proportion of newly hired apprenticeship graduates trained elsewhere (first job after apprenticeship) on all newly hired workers with an apprenticeship degree. The second variable specifies poaching only counting recruits paid a salary above the market level in the numerator. The nominator is the same so that this variable specifies poaching when the poaching firm pays high wages. The third variable further limits the group of employer switchers to those who did not switch their occupation.

We discuss firms' reputation to offer long-term contracts (internal labour markets) as a strategy to avoid poaching. Ariga et al. (2000, p. 71-81) argue that seniority is not fully informative of internal labour markets because the same average tenure can be consistent with substantially different employment policies in other firms. They therefore propose to combine firm specific tenure with general experience in order to characterise internal labour markets instead of just looking at average tenure. In this line, we calculate the difference between experience and tenure. This difference is close to zero in companies which usually hire workers at the beginning of their career because they offer internal careers. The difference increases when the company does not offer internal careers and therefore more likely hires experienced workers.

Establishments' reputation to offer long-term contracts is further measured by signals which are observable and verifiable by outsiders (Tuor and Backes-Gellner 2010). External indicators are the coverage of a works council, a collective bargaining agreement and the age of the establishment. Such signals may be important in the recruiting process since company specific workplace characteristics such as job security, working conditions and career opportunities are unobservable for potential employees. Instead these characteristics are related to observable employer signals such as works councils or establishment age (Smits 2006, Tuor and Backes-Gellner 2010). A works council, for example, may be a credible signal for potential hires suggesting a higher probability of long-term career perspectives, more family friendly practices, fostering human capital generation and better working conditions (Smith 1991, Backes-Gellner et al. 1997, Heywood and Jirjahn 2009, Addison *et al.* 2010). Collective bargaining agreements signal higher wages for potential hires which may be an argument to switch the employer (Hübler and Jirjahn 2003). Finally, older establishments have a higher probability to establish a reputation as a trustful employer, more likely offer pension schemes and better working conditions and therefore pay lower wages for a given quality of workers because workers prefer such conditions (Brown and Medoff 2003,

Jirjahn *et al.* 2009). Additionally, we check whether training or non-training firms poach apprenticeship graduates.

Because our key hypotheses concern recruitment, it is also essential to control for a number of further determinants. An establishment recruits skilled workers either to replace workers who have quitted or been laid off or because of extending employment. Replacement is controlled for by the share of workers with an apprenticeship degree who leave the establishment on all workers on this skill level. Extending employment is calculated by the development of establishment-level workforce during the last 12 months. In addition, we extract numerous other control variables that previous research has identified as potential factors driving labour turnover (Capelli and Neumark 2004). We include firm size because larger organisations attract potential hires with better internal career opportunities, higher wages and may be more prone to offer better working conditions (Pfeffer and Cohen 1984, Winter-Ebmer and Zweimüller 1999). Moreover, the composition of the workforce determines companies' recruitment strategy. Unskilled workers, for example, have a higher unemployment rate and are therefore easier to hire than highly specialised skilled employees. We also include the education level of the workforce, whether the establishment is located in East Germany and industry dummies.

Empirical Strategy: Our hypotheses posit a relationship between establishment-level recruitment strategies and the opportunity to retain apprenticeship graduates on internal labour market type contracts. We estimate the incidence of the dependent variables using a probit procedure with standard errors clustered at the establishment because some establishments might be observed several times in our data set. Then, we estimate the intensity of poaching using a Tobit procedure because a sizeable fraction of establishments does not hire employees with an apprenticeship degree because their profit-maximising choice between hiring own apprenticeship graduates, apprenticeship graduates trained elsewhere and experienced skilled workers is at the corner of the decision space – hence we use a corner solution model to analyse this strategy.

4.4. Results

Table 4.1 presents the determinants of poached establishments. The dependent variable in the left column is the proportion of internal apprenticeship graduates on all new hires with an apprenticeship degree. This variable measures whether an establishment is able to meet its

demand of skilled labour through internal training. The right column presents regressions on the within-firm retention rate, defined as the proportion of retained apprenticeship graduates on all apprenticeship graduates. This variable measures the capability of training companies to keep their apprenticeship graduates. Both proportions show a strong association to internal labour market-type employment relations.

Table 4.1: Determinants of Establishments which recruit apprenticeship graduates trained elsewhere and establishments retaining apprenticeship graduates

	Internal Recruitment		Within-Firm Retention Rate	
	Probit	Tobit	Probit	Tobit
Works Council	0.5527 (11.48)	0.6589 (12.77)	0.1345 (2.95)	0.0123 (0.73)
Collective Bargaining	0.1057 (3.13)	0.2158 (5.75)	0.0535 (1.26)	0.0208 (1.23)
Above-Tariff Salary	0.1493 (4.52)	0.0778 (2.35)	0.1792 (4.32)	0.0354 (2.51)
Old Establishment	0.2192 (5.68)	0.1959 (4.71)	0.0777 (1.66)	0.0111 (0.59)
Difference Experience and Tenure / 100	-0.0002 (10.84)	-0.0002 (10.83)	-0.0114 (6.35)	-0.0035 (5.35)
Number of Observations	16937	16937	9462	9462
Pseudo R Square	0.3014	0.146	0.1674	0.0847

T and Z-Values, respective, are given in parenthesis, complete regression output in table A2 and A3; standard errors are clustered on establishments; Source LIAB longitudinal version 2, 1999-2003.

In detail, a signal of long-term commitment is the average difference between experience and tenure in an establishment. A number close to zero reveals a high share of workers that an establishment usually recruits at the beginning of their carrier. The coefficient shows that an establishment which recruits new workers with on average five years of experience has an 18.6 percent higher probability to retain apprenticeship graduates than an establishment whose new recruits have on average 10 years of experience. Moreover, labour market institutions which signal long-term commitment have a positive influence on the probability of internal recruitment and retaining apprenticeship graduates. In other words, training establishments which fail to offer a long-term perspective cannot attract a sufficient number of apprenticeship graduates. Moreover, establishments which are able to offer long-term employment relations are more likely able to cover their skill demand by own training efforts. Reputation seems to effectively prevent poaching in a wide sense.

We turn to the determinants of poaching. The determinants are measured with three dependent variables all of which differ in their numerator but have the same denominator, the number of new recruits which have an apprenticeship degree. The nominator of the first variable (left two columns in table 4.2) counts all new external recruits with an apprenticeship degree who get their first job after apprenticeship training. This is the broadest poaching definition. The second variable counts only those poached apprenticeship graduates who receive a wage above the market wage for the first job after the apprenticeship in an occupation. This variable defines poaching when the poaching establishment is willing to pay a wage above the market-level. The third variable tests the opposite direction and measures all new recruits who have changed their occupation for the first job. Switching occupation reveals a lower demand of occupation-specific skill.

Table 4.2 shows that the difference between experience and tenure has only a small impact on the proportion of all newly recruited apprenticeship graduates trained elsewhere but a much stronger on those apprenticeship graduates who receive a wage above the market wage for labour market entrants. An establishment, for example, with on average 5 years lower difference between experience and tenure has a 16 percent higher probability of hiring apprenticeship graduates trained elsewhere. To the contrary, those establishments are less likely to hire occupational switchers. The other variables which usually signal an internal labour market show mixed results.

Another interesting finding concerns the training establishment dummy. Training establishments more likely poach apprenticeship graduates trained elsewhere than non-training establishments. This may be based on two effects. On the one hand, training establishments may have different skill requirements than non-training establishments and, therefore, have a higher willingness to pay a high salary to effectively poach apprenticeship graduates. On the other hand, Sadowski (1980) discusses the “common training motivation”. Since training entails high fixed and low variable costs, training establishments train more apprentices than required so that a pool of skilled workers is available. Training establishments can hire these additional trainees when they face a higher demand of skilled workers than expected. Such an agreement can be enforced by employer associations which monitor apprenticeship training and may force establishments to participate in such a training scheme in a certain region and industry. However, this effect has to be analysed more in-depth using different occupations for example – a key question is whether poaching for apprentices in occupations that require high investments is different from occupations with no net costs.

Table 4.2: Determinants of External Recruitments, Recruitments of Occupational Switchers and Recruitments above the Market Wage for Labour Market Entrants with an Apprenticeship Degree in a Given Occupation

	External Recruitment		External Recruits with Wages Above Market Wage		External Recruits of Occupational Switchers	
	Probit	Tobit	Probit	Tobit	Probit	Tobit
Training Company	0.5102 (12.70)	-0.2944 (9.32)	0.4289 (9.68)	0.4289 (9.68)	-0.2944 (9.32)	0.8263 (10.96)
Works Council	0.2992 (8.48)	-0.0970 (3.04)	0.3202 (8.28)	0.3202 (8.28)	-0.0970 (3.04)	0.5804 (11.03)
Collective Bargaining	-0.0355 (1.10)	0.0331 (1.35)	-0.0449 (1.22)	-0.0449 (1.22)	0.0331 (1.35)	0.2380 (6.31)
Above-Tariff Salary	-0.0252 (0.82)	0.0579 (2.34)	-0.0130 (0.39)	-0.0130 (0.39)	0.0579 (2.34)	0.0937 (3.29)
Old Establishment	-0.0862 (2.52)	0.0232 (0.87)	-0.1632 (4.29)	-0.1632 (4.29)	0.0232 (0.87)	0.0178 (0.47)
Difference Experience and Tenure / 100	0.0009 (0.69)	-0.0088 (9.16)	0.0019 (1.36)	0.0019 (1.36)	-0.0088 (9.16)	-0.0096 (6.56)
Number of Obs.	16937	16937	16937	16937	16937	16937
Pseudo R Square	0.1575	0.1088	0.1584	0.1584	0.1088	0.1521

T and Z-Values, respective, are given in parenthesis, complete regression output in appendix Table A4-A6.; standard errors are clustered on establishments; Source LIAB longitudinal version 2 1999-2003.

4.5 Discussion

This paper presents the first empirical analysis of the determinants of poaching and poached establishments. We identify poaching and poached establishments using apprenticeship graduates in Germany. Apprenticeship graduates are a good basis for a poaching analysis because training is regulated in the Vocational Training Act and therefore the skills are observable by outsiders and transferable to other companies. We show that poached firms fail to credibly offer long-term contracts. Moreover, training firms more likely poach apprenticeship graduates trained elsewhere than non-training firms. This may be an indicator for a segmented labour market where training and non-training companies recruit differently.

These results shed new light on a series of theoretical poaching models. Training models define poaching when social returns exceed private ones. However, they assume that employees have full information about working conditions, career possibilities and their own ability compared to others at the start of the apprenticeship. When employees learn such information over the apprenticeship and prefer good working conditions and internal career

possibilities, employers who cannot offer such work places fail to attract apprenticeship graduates.

The results require a more in-depth analysis. An analysis should take into account selectivity in apprenticeship training, time-invariant heterogeneity and simultaneity of the hiring and training decision. Moreover, varying the control group such as occupations that differ in their investment requirements for the training firm may also reveal new patterns. Apprenticeships in blue-collar occupations, for instance, require a higher investment and are considered to be more firm and occupation specific than white-collar occupations. Comparing both occupation groups may reveal additionally insights in the poaching behaviour of firms.

Appendix**Table 4.A1: Variable Definition and Descriptive Statistics (N=16937)**

<i>Dependent Variables:</i>	<i>Description (Mean, Standard Deviation)</i>
Within-Firm Retention Rate	Proportion of retained apprenticeship graduates on all graduated apprenticeship graduates (0.5732, 0.3901)
Internal Recruits	Proportion of own apprenticeship graduates hired for skilled work on all newly hired workers with an apprenticeship certificate (0.2226, 0.7232)
External Recruits	Proportion of newly hired apprenticeship graduates trained elsewhere (first job) on all newly hired workers with an apprenticeship certificate (0.0674, 0.2021)
External Recruits with Wages Above the Market Wage	Proportion of newly hired apprenticeship graduates trained elsewhere (first job) with a wage above the market wage for labour market entrants on all newly hired workers with an apprenticeship certificate (0.1540, 0.5824)
External Recruits of Occupational Switchers	Proportion of newly hired apprenticeship graduates trained elsewhere (first job) who switch the training occupation on all newly hired workers with an apprenticeship certificate
<i>Training Commitment:</i> Apprenticeship Training	Dummy variable equal to 1 if the establishment trains apprentices (0.7523, 0.4317)
<i>Reputation Measures:</i> Difference Experience and Tenure	Average difference between experience and tenure, both measures start counting with the first job subjected to social insurance contribution after the apprenticeship (or internship for university graduates) (2252.87, 1338.32)
Works Council	Dummy variable equal to 1 if the establishment has a works council (0.4957, 0.4999)
Above-Tariff Salary	Dummy variable equal to 1 if the establishment pays above the collective agreement (0.3309, 0.4706)
Collective Bargaining Agreement	Dummy variable equal to 1 if the establishment is covered by a collective bargaining agreement (0.6348, 0.4815)
Old Establishment	Dummy variable equal to 1 if the establishment was founded before 1989 (0.6619, 0.4730)
<i>Controls:</i> Number of Employees	Number of Employees (246,07, 826.68)
Employment Development during the Last Year	Percentage increase of the number of employees during the last year
Leavers	Proportion of employees with an apprenticeship degree who leave the establishment on all employees (0.0467, 0.0729)
Apprentices	Proportion of apprentices on all employees (0.06452, 0.0918)
<i>Table continued next page</i>	

Table A1 continued

Without Completed Apprenticeship and without Tertiary School Degree	Worker without completed apprenticeship and without tertiary school degree as a proportion of all employees (0.0795, 0.1242)
With Completed Apprenticeship and without Tertiary School Degree	Workers with completed apprenticeship and without tertiary school degree as a proportion of all employees (0.6779, 0.2049)
University Degree	Workers with a university or polytechnics degree as a proportion of all employees (0.0934, 0.1400)
Part Time Workers	Part-Time worker as a proportion of all employees (0.1233, 0.1983)
Foreigners	Non-German workers as a proportion of all employees (0.0452, 0.0921)
Females	Female workers as a proportion of all employees (0.3969, 0.3029)
Single Site Company	Dummy variable equal to 1 if the establishment is a single site company (0.6703, 0.4701)
East German	Dummy variable equal to 1 if the establishment is located in East Germany (0.4333, 0.4955)

Source LIAB longitudinal version 2 1999-2003.

Table 4.A2: Determinants of the Within-Firm Retention Rate

	Probit		Tobit	
	Coef.	T-Value	Coef.	T-Value
Works Council	0.1345	2.95	0.0123	0.73
Collective Bargaining	0.0535	1.26	0.0208	1.23
Above-Tariff Salary	0.1792	4.32	0.0354	2.51
Old Establishment	0.0777	1.66	0.0111	0.59
Difference Experience and Tenure / 100	-0.0001	-6.35	0.0000	-5.35
Number of Employees	0.0026	4.22	0.0002	3.30
Squared Number of Employees	0.0000	-10.87	0.0000	-5.60
Employment Growth	-0.0006	-1.11	-0.0001	-2.43
Leavers	-1.4191	-3.71	-0.7877	-4.27
Apprentices	-1.8350	-5.59	-1.1519	-8.83
Without Completed Apprenticeship and without Tertiary School Degree	-1.1075	-3.21	-0.2138	-1.76
With Completed Apprenticeship and without Tertiary School Degree	-0.8441	-2.87	-0.2178	-2.08
University Degree	-1.8782	-5.45	-0.5398	-4.14
Part Time Workers	-0.5794	-4.12	-0.3979	-3.13
Foreigners	-0.2328	-0.82	-0.2884	-4.94
Females	0.2691	2.88	0.0947	0.96
Single Site Company	-0.0486	-1.15	0.0783	2.14
East German	-0.1645	-2.94	-0.0027	-0.20
Constant	1.4227	4.72	-0.2106	-0.44
Number of Observations	9462		9462	
Prob > F (chi sq)	0		.	
Pseudo Rsq	0.1674		0.0847	
Log Pseudolikelihood	-4421.229		-7214.34	

Regressions include 6 industry and 3 year dummies and the share of workers with missing education; standard errors are clustered on establishments, reference category share of workers with tertiary school degree. Source: LIAB longitudinal version 2 1999-2003.

Table 4.A3: Determinants of recruited own apprenticeship graduates

	Probit		Tobit	
	Coef.	T-Value	Coef.	T-Value
Works Council	0.5527	11.48	0.6589	12.77
Collective Bargaining	0.1057	3.13	0.2158	5.75
Above-Tariff Salary	0.1493	4.52	0.0778	2.35
Old Establishment	0.2192	5.68	0.1959	4.71
Difference Experience and Tenure / 100	-0.0002	-10.84	-0.0002	-10.83
Number of Employees	0.0019	2.83	0.0001	0.40
Squared Number of Employees	0.0000	-6.98	0.0000	-6.92
Employment Growth	0.0000	-0.02	0.0004	1.80
Leavers	-2.7701	-8.62	-3.7985	-9.15
Apprentices	2.8994	11.54	3.0467	9.59
Without Completed Apprenticeship and without Tertiary School Degree	-1.0699	-4.99	-1.1826	-4.67
With Completed Apprenticeship and without Tertiary School Degree	-0.5938	-3.43	-0.6164	-2.82
University Degree	-1.1360	-5.36	-0.9354	-3.42
Part Time Workers	-0.4063	-3.98	-0.4476	-4.40
Foreigners	-0.4559	-2.28	-0.3684	-1.98
Females	0.2003	2.75	0.0936	1.35
Single Site Company	-0.0132	-0.33	0.0012	0.03
East German	-0.2246	-4.86	-0.2281	-4.60
Constant	-0.0610	-0.33	-0.1395	-0.59
Number of Observations	16937		16937	
Prob > F (chi sq)	0		0	
Pseudo Rsq	0.3014		0.146	
Log Pseudolikelihood	-5932.708		-14188.63	

Regressions include 6 industry and 3 year dummies and the share of workers with missing education; standard errors are clustered on establishments, reference category share of workers with tertiary school degree. Source: LIAB longitudinal version 2 1999-2003.

Table 4.A4: Determinants of newly recruited apprenticeship graduates trained elsewhere

	Probit		Tobit	
	Coef.	T-Value	Coef.	T-Value
Training Company	0.5102	12.70	0.1679	10.03
Works Council	0.2992	8.48	0.1019	7.54
Collective Bargaining	-0.0355	-1.10	0.0081	0.63
Above-Tariff Salary	-0.0252	-0.82	-0.0077	-0.64
Old Establishment	-0.0862	-2.52	-0.0375	-2.70
Difference Experience and Tenure / 100	0.0000	0.69	0.0000	-2.28
Number of Employees	0.0023	6.50	0.0002	6.36
Squared Number of Employees	0.0000	-10.90	0.0000	-8.06
Employment Growth	-0.0011	-3.66	0.0000	-1.39
Leavers	1.5694	8.13	0.2376	3.63
Apprentices	-0.5029	-2.33	-0.0627	-0.65
Without Completed Apprenticeship and without Tertiary School Degree	0.2215	1.16	0.0386	0.48
With Completed Apprenticeship and without Tertiary School Degree	0.0151	0.10	-0.0248	-0.35
University Degree	-1.0053	-5.22	-0.3534	-4.09
Part Time Workers	0.0898	1.03	-0.0085	-0.26
Foreigners	0.4898	3.05	0.0798	1.34
Females	0.0664	1.01	0.0385	1.48
Single Site Company	-0.1254	-3.97	-0.0433	-3.78
East German	0.0781	1.84	0.0045	0.27
Constant	-1.4563	-8.27	-0.5001	-6.23
Number of Observations	16937		16937	
Prob > F (chi sq)	0		0	
Pseudo Rsq	0.1574		0.079	
Log Pseudolikelihood	-8906.05		-8040.42	

Regressions include 6 industry and 3 year dummies and the share of workers with missing education; standard errors are clustered on establishments, reference category share of workers with tertiary school degree. Source: LIAB longitudinal version 2 1999-2003.

Table 4.A5: Determinants of newly recruited apprenticeship graduates trained elsewhere who switched the occupation

	Probit		Tobit	
	Coef.	T-Value	Coef.	T-Value
Training Company	0.4289	9.68	0.1015	7.14
Works Council	0.3202	8.28	0.0925	7.02
Collective Bargaining	-0.0449	-1.22	-0.0017	-0.15
Above-Tariff Salary	-0.0130	-0.39	-0.0102	-0.99
Old Establishment	-0.1632	-4.29	-0.0462	-3.96
Difference Experience and Tenure / 100	0.0000	1.36	0.0000	-0.47
Number of Employees	0.0016	5.54	0.0002	4.95
Squared Number of Employees	0.0000	-9.42	0.0000	-8.03
Employment Growth	-0.0008	-2.98	0.0000	-0.90
Leavers	2.2582	10.54	0.4638	7.93
Apprentices	-1.2762	-4.47	-0.3651	-3.67
Without Completed Apprenticeship and without Tertiary School Degree	1.0833	5.17	0.2842	4.07
With Completed Apprenticeship and without Tertiary School Degree	0.1600	0.89	-0.0079	-0.12
University Degree	-0.5426	-2.51	-0.1664	-2.12
Part Time Workers	0.1942	1.98	0.0432	1.49
Foreigners	0.7360	4.25	0.1019	2.06
Females	-0.1766	-2.33	-0.0582	-2.51
Single Site Company	-0.1534	-4.50	-0.0380	-3.73
East German	0.2195	4.55	0.0573	3.74
Constant	-2.1168	-10.44	-0.5953	-7.87
Number of Observations	16937		16937	
Prob > F (chi sq)	0		0	
Pseudo Rsq	0.1584		0.1169	
Log Pseudolikelihood	-7056.25		-5198.404	

Regressions include 6 industry and 3 year dummies and the share of workers with missing education; standard errors are clustered on establishments, reference category share of workers with tertiary school degree. Source: LIAB longitudinal version 2 1999-2003.

Table 4.A6: Determinants of newly recruited apprenticeship graduates trained elsewhere with wages above the market wage for labour market entrance

	Probit		Tobit	
	Coef.	T-Value	Coef.	T-Value
Training Company	-0.2944	-9.32	0.8263	10.96
Works Council	-0.0970	-3.04	0.5804	11.03
Collective Bargaining	0.0331	1.35	0.2380	6.31
Above-Tariff Salary	0.0579	2.34	0.0937	3.29
Old Establishment	0.0232	0.87	0.0178	0.47
Difference Experience and Tenure / 100	-0.0001	-9.16	-0.0001	-6.56
Number of Employees	0.0023	7.71	0.0002	1.40
Squared Number of Employees	0.0000	-12.40	0.0000	-6.58
Employment Growth	-0.0004	-1.02	0.0002	1.57
Leavers	-4.3972	-16.87	-0.0639	-0.30
Apprentices	0.9873	6.42	0.0428	0.19
Without Completed Apprenticeship and without Tertiary School Degree	-0.6279	-4.30	-0.7381	-3.57
With Completed Apprenticeship and without Tertiary School Degree	-0.1441	-1.33	-0.3736	-2.03
University Degree	-0.1390	-1.06	-0.6473	-2.89
Part Time Workers	-0.1260	-1.98	-0.2351	-2.60
Foreigners	-0.1079	-0.85	0.3505	2.25
Females	0.3162	6.85	-0.2185	-3.23
Single Site Company	0.1264	4.55	-0.0766	-2.47
East German	-0.0817	-2.52	0.0989	2.25
Constant	0.4273	3.52	-1.3532	-5.58
Number of Observations	16937		16937	
Prob > F (chi sq)	0		0	
Pseudo Rsq	0.1088		0.1521	
Log Pseudolikelihood	-14815		-12338.65	

Regressions include 6 industry and 3 year dummies and the share of workers with missing education; standard errors are clustered on establishments, reference category share of workers with tertiary school degree. Source: LIAB longitudinal version 2 1999-2003.

CHAPTER 5

THE INSTITUTIONAL FRAMEWORK OF APPRENTICESHIP TRAINING: THE PARTICULAR CASE OF WORKS COUNCILS

Unpublished working paper together with Uschi Backes-Gellner and Paul Marginson

5.1 INTRODUCTION

A major challenge of economic policy measures remain the extension of apprenticeships when the demographic development increases the supply of apprentices. New apprenticeships can be created through additionally apprenticeships in training companies or through additionally training firms. Motivating firms to become involved in apprenticeship training requires an institutional framework that allows training companies to benefit either in substitution or in investment motivated apprenticeship training. A key institution is the industrial relations system, in particular the works councils (Finegold and Soskice 1988, Soskice 1994, Backes-Gellner 1996, Ryan 2001, Culpepper 2003). Therefore, we can learn a lot about the creation of new apprenticeships by analysing the establishment of a works council.

Early empirical papers about the establishment of works councils by Addison et al. (2003) and Dilger (2003) estimate determinants of newly established works councils but do not discuss why works councils are established. In contrast, Jirjahn (2009) discusses workers' motivation for establishing a works council and argues that employees establish a works council to limit opportunistic behaviour of employers. Because opportunistic behaviour is more likely during economic downturns, Jirjahn (2009) and Kraft and Lang (2008) show that works councils are more likely introduced during economic downturns. Nevertheless, many uncovered companies (e.g. without a works council) face economic downturns but only in a few firms establish a works council. Thus, an economic downturn may be a necessary but not a sufficient condition for establishing a works council.

To understand the establishing process more in-depth, we extend previous studies in two dimensions. First, we examine specific events that motivate workers for establishing a works council. These events such as a change of the owner, a partial plant closure and a radical restructuring of the company occur more likely but not only during an economic downturn. Second, we study the actor or agent who triggers the establishment of a works council. Establishing a works council in conjunction with or against the will of the management reveals the managerial attitude and managerial response to worker representation. This paper analyses trigger events and agents with a detailed survey and test then the events on a national representative dataset.

In detail, the paper shows that a change of the owner increases the probability of establishing a works council. A new owner may mark a change in working conditions, leadership and compensation schemes of a plant. Workers who worked in the plant because working conditions and leadership of the former owner fitted their preferences are now unsatisfied and willing to establish a works council. Similar, a partial plant closure and a radical restructuring can indicate changing working conditions and can threaten the security of workplaces, both of which trigger the establishment of a works council. In these situations, works councils are an instrument of risk protection. Works councils protect workers against the risk of employer opportunism, in particular, overcome information asymmetries, enforce implicit arrangements and enhance workers' bargaining power. Furthermore, the panel design of our study shows a clear pattern of newly established works councils over the business cycle after controlling for organisational shocks.

Moreover, previous studies assume, due to the lack of data, that workers alone establish the works council. Contrary, we have information about the initiator of the establishing process and we show that the management is involved in around one third of all cases and has in a minority of cases motivated workers to establish a works council. This finding allows differentiations about the quality of intra-firm industrial relations, specifically managerial response which is considered as the most important factor in collective voice theory (Freeman and Medoff 1984, Bryson 2004, Addison 2009).

The remainder of this paper is structured as follows: first, we present an overview of institutions, discuss motivations for establishing a works council, and derive our main hypotheses (section 2). Then, we describe our data and estimation strategy (section 3). Afterwards, we present our results on trigger agents and trigger events (section 4) and conclude and discuss generalisation of our results to other countries (section 5).

5.2 INSTITUTIONS, THEORY AND HYPOTHESES

Institutional Framework

Works councils' rights are laid down in the Works Constitution Act. Councils shall be elected by the workforces of establishments with five or more employees. Although their creation depends on the initiative of establishment's employees, councils are not present in all eligible establishments. Works councils have full codetermination rights (participation or veto rights) on a set of issues, including introduction of new payment methods, overtime work, and the use of technical devices designed to monitor employee performance. They have weaker consultation rights in matters such as changes in equipment and working methods that affect job requirements. Their information rights cover financial and economic matters (Hübler and Jirjahn 2003, Addison 2009).

Even if only workers can establish a works council, case studies show that managers also sometimes motivate workers for establishing a works council, or that management and workers cooperate for the establishment (Schlömer et al. 2007). Therefore, we discuss trigger events for establishing a works council for both agents the workforce and the management.

Risk Protection as Workers Motivation

For workers, works councils are an instrument to protect workers against employer opportunism, in particular, break implicit contracts about compensation schemes, working conditions, fringe benefits, cooperative culture and leadership (Smith 1991, Freeman and Lazear 1995, Kaufman and Levine 2000, Jirjahn 2009). Implicit contracts are common in employment relations which are characterised by information asymmetries (Hogan 2001). Although implicit contracts are usually self-enforcing due to reputation mechanisms, employers and employees may cooperate initially but the employer may be tempted to renege on the promises made to the employees. Employers can behave opportunistically with respect to information, payment, employment and working conditions (Freeman and Lazear 1995, Ramey and Watson, 1997, Bertrand 2004, Jirjahn 2009).

Thus, each company offers jobs including an implicit contract about certain working conditions, compensation schemes and a cooperative culture, arrangements which are neither contractible nor enforceable and therefore implicit. When managers announce lay-offs, cancel fringe benefits or increase work load, workers demand an institution that protects their interests. Works councils are an instrument for risk protection because works councils have legal

co-determination rights on personnel issues. These statutory rights reduce uncertainty and the risk of arbitrary management decisions so that works councils are an instrument to safeguard workers interests. Legal co-determination rights can discipline managers for breaking the implicit contract.

Managers may have reasonable arguments for cancelling the implicit contract, for instance, competition and innovation force a restructuring and the economic situation does not allow paying fringe benefits anymore. However, as long as workers cannot evaluate whether the economic situation requires such concessions by workers or whether managers only want to increase their rent share on workers costs (information asymmetry), workers will be inclined to establish a works council because works councils have legal access to information on financial and economic matters.

Furthermore, an owner change can trigger the establishment of a works council. A new owner can introduce a new cooperative culture, change compensation and working conditions but the conditions of the former owner fitted workers preferences so that workers resist those changes. The resentment can lead to the wish of legal co-determination which protects workers interests. Works council provide workers with information, enforce implicit contracts by disciplining the firm for breaching the implicit contract and enhance workers' bargaining power (Hogan 2001).

These events or organisational shocks more likely causes the establishment of a works council because breaking implicit contracts constitutes an utility loss for workers, either an pecuniary or an non-pecuniary one. A sufficiently strong loss can motivate workers to call for action as behavioural economists have shown. Because workers value a potential loss higher as a similar gain conditioned to a certain reference point, this so called loss aversion more likely trigger an action than a similar utility gain (Tversky and Kahneman 1991, Kahneman et al. 1991). In our case, customized working conditions are the reference point and a strong deterioration of working conditions is a reasonable trigger event that workers act and establish a works council.

Worker demand risk protection when an implicit contract between management and workforce requires renegotiations. Employers more likely break an implicit contract when an organisational shock such as a restructuring, plant closure and an owner change occur. Breaking the implicit contract result in deteriorate working conditions which mark an utility loss for workers and the loss can trigger the establishment of a works council by workers.

Solving the Commitment Problem as Managerial Motivation

For managers, solving commitment problems is main advantage of works councils. Even if only workers can legally establish a works council, solving the commitment problem can be a motivation for managers to support the establishment. Commitment problems can arise in a variety of situations. Workers may withhold information about potentially performance-enhancing innovations when they fear that the employer might use the information about innovations to their disadvantage such as intensify work load or job cuts (Jirjahn et al. 2009). Employees may refuse concessions even when those concessions may be necessary to overcome a crisis of the establishment, if employees fear that the employer overstates the crisis to demand greater concessions (Jirjahn and Smith 2006).

Works councils can solve commitment problems and create trustful employment relations and cooperation which enable a more effective communication and increase the legitimacy of management decisions (Hall et al. 2007). Thus, employees are willing to share their ideas for improving the efficiency of production. Further, works councils increase work satisfaction (Cornelissen et al. 2008) which lead to a reduction in quitting. A lower turnover suggests lower hiring and training costs and less disruption in the functioning of works groups. The likelihood that workers and firms remain together for a long period increase the incentive for investments in skills specific to the enterprise, which also raise productivity (Freeman and Medoff 1984).

However, employee involvement gives workers a stronger bargaining position to renegotiate firm's rents. Rent redistribution is the main reason that managers oppose the establishment of a works council, particularly when the expected increase of the rent share for the workforce offsets the expected increase in total rent (Freeman and Lazear 1995). Although works councils have no legal right to strike, it can still increase workers' bargaining power using their veto rights or delaying decisions where participation and consultation rights prevail (Visser 1995, Jirjahn et al. 2009). Moreover, management needs more time for preparing consultations and persuading works councillors (Hall et al. 2007). When the management expect that productivity enhancement, due to solving commitment problems, outweigh expected losses, due to rent redistribution and loss of control in decision making, they support or motivate workers for establishing a works council.

5.3 DATA, METHODS AND VARIABLES

Empirical Strategy. We use two data sources to analyse events that trigger the establishment of a works council and the agent who trigger it. The IfM Bonn Works Council Survey allows in-depth descriptions of the establishing process regarding the trigger event and the agent but does not include questions about organisational shocks for firms that did not establish a works council and does not include a time dimension. Therefore, we turn to the IAB Establishment Panel and estimate the influence of an organisational shock on the probability of establishing a works council.

Data-Sets. The IfM Bonn Works Council Survey is a unique cross-section dataset about co-determination in small- and medium-sized companies in Germany. The unique feature of this survey is a set of questions about the establishment of a works council. All companies covered by a works council report the trigger event, trigger agent and year of establishment. The dataset is representative of companies with 20 to 500 employees and was collected by the Small and Medium Size Enterprise Research Institute in 2005 (Institut für Mittelstandsforschung – IfM, for a detailed data description see Schlömer et al. 2007). Because the survey was collected in 2005, several years after most works council were established, we drop all companies where the manager reports that he or she cannot remember or was not in charge at the time of establishment. Further, we restrict the sample on companies that established their works council between 2001 and 2005. We draw this sub-sample because these companies also report the number of employees at the time of establishment, which is necessary for subsequent regression analyses. This yields a sample of 60 companies that established a works council between 2001 and 2005.

The IAB Establishment Panel is a representative survey based on a stratified random sample from the population of all German establishments. We use the waves 1999-2007 of this panel in which information about works council status, organisational shocks, and other firm characteristics for each company are available (for data description see Jacobebbinghaus 2008). We drop non- profit companies, agriculture firms, all companies with more than one change in their works council status and all companies that switch from having to not having a works council. Further, we drop all firms with less than 5 employees because of the legal threshold for establishing a works council.

We use the IfM Bonn Works Council Survey for detailed descriptive analyses and the IAB Establishment Panel for our main regressions so that we derive our variables for the latter dataset.

Dependent Variable: We identify all firms which do not have a works council in the last but report to be covered by a works council in the following year as newly established works councils. The probability of establishing a works council for a random uncovered company is around 1 percent. Even if the establishment of a works council is a rare event, we identify 273 newly established works councils in the IAB Establishment Panel. The control group contains all establishments that have not established a works council between two observation periods. Table 5.A2 in the appendix shows descriptive statistics of newly established works councils.

Explanatory Variables: Several variables capture the trigger events based on risk protection. First, we define a set of dummy variables for organisational shocks that directly influence the security of workplaces, such as a partial plant closure, an outsourcing and a spin-off of a part of the establishment. These, relatively rare events, threaten the workplace security as a part of the implicit contract and therefore should have a strong incentive for workers to establish a works council. Second, a radical reorganisation breaks the implicit contract between workers and management when it entails job-cuts and worsens working conditions.

Third, an owner change can threat the implicit contract when new owners change working conditions but workers stay in the firm because working conditions under the old owner fitted their preferences. Moreover, new owners may cut fringe benefits so that workers suspect losing the rents which they have created with their effort. We define an owner change when a company was a single site company in the last year and is a branch of a bigger company next year.

Additionally to these trigger events, we check determinants of establishing a works council which are used in previous studies. A bad economic perspective lowers profits and can force managers for announcing wage-cuts and urging workers to increase their effort, all of which threaten the implicit contract (Jirjahn 2009). Similar to Kraft and Lang (2008) and Jirjahn (2009) we use the establishment-level employment growth as indicator for a establishment-level indicator for a bad economic situation defines as the percentage increase or decrease to last year employees. Additionally, the panel design additionally allows a variable measuring the deviation from the mean growth for each sector and year. This variable enables the measurement of the establishment of works councils over the business cycle. A negative deviation from the sectoral mean growth in a particular year should be correlated with a higher probability of establishing a works council. Note, the deviation from sectoral mean growth is independent of establishment-level trigger events that can occur in good as well as in bad times.

Control Variables. In addition to our variables of key interest, we control for other variables that determine the establishment of a works council (Addision et al. 2003, Dilger 2003, Kraft and Lang 2008, Jirjahn 2009). Firm size may have a positive influence on establishing a works council. The number of employees indicates a more complex and hierarchical organisation, where councils mitigate transaction costs. Moreover, the legal rights of works councils are stronger in larger firms and the stronger rights might increase workers' incentive for establishing a works council (Jirjahn 2009). Furthermore, we include several variables for the composition of the workforce and take into account that different types of workers may differ in their taste for representation. Skilled Workers may more likely establish a works council because their firm-specific human-capital investments are threatened by a job loss. In contrast, works councils face difficulties in effectively representing part-time employees (Jirjahn and Smith 2006).

Further, variables that influence the coverage of works councils can also influence the establishment, for example East-German firms tend to have a lower probability of coverage and older establishments a higher (Zwick 2004). Moreover, we include a dummy for payment above the collective agreement and the presence of a collective bargaining agreement. Hübler and Jirjahn (2003) show that collective bargaining coverage discourages workers from adopting a council because it limits the scope for establishment-level bargaining. Accordingly, companies switching to collective bargaining might discourage workers for establishing a works council. Furthermore, export oriented firms, as a common proxy for international competitiveness, and firms with higher investments per capita, a common proxy for capital stock, usually have higher human capital investments which make earning losses bigger when leaving the company (Zwick 2004). Moreover, the legal form and the ownership status of an establishment may have an influence on the probability that the management break the implicit contract (Jirjahn 2009).

5.4 FINDINGS

Using the IfM Bonn works council survey, we present descriptive evidence about specific trigger events for establishing a works council. Then, we present the agents who triggered the establishment and examine correlations between both. Afterwards, we turn to the IAB Establishment Panel and analyse the role of these trigger events on the probability of establishing a works council comparing firms that have established a works council with firms that have not.

Trigger events

The IfM Bonn Works Council Survey asks managers about specific events which triggered the establishment of their works council. Managers report that organisational shocks are a relevant trigger in 43 percent (table 5.1). The most important organisational shock is a change of the owner (32 percent).¹ Thus, workers seem to consider a new owner as a menace to the implicit contract. Workers, for instance, suspect that new owners cut fringe benefits, change working conditions and prefer a new management style whereby the style and conditions of the former owner fitted workers' preferences.

Moreover, requiring risk protection is much more obvious when an organisational shock threatens the security of workplaces, for instance, when managers announce a radical reorganisation, or a partial plant closure. Thus, workers have an even stronger incentive for establishing a works council. These events naturally happen seldom but are frequently identified as trigger events. A partial plant closure triggers the establishment of a works council in 3 percent and a radical restructuring in 15 percent of all cases.²

Workers are willing to protect their interests, in particular, enforce an implicit contract and reduce information asymmetries, when an organisational shock occurs or the owner changes. Contrary, the second category "workers voice" (68 percent) cannot unambiguously be assigned to one motivation. For example, the category "conflicts between management and workers" (10 percent) can either result from risk protection spurred by something like management's plan for cancelling fringe benefits or from workers strategy for enhancing workers rent-share. A similar argument holds true for the category "workers want more codetermination" (18 percent) and "the management know no reason why workers established a works council" (27 percent). In contrast, the last category "new workers with works council experi-

1 A change of the owner is more widely defined as in the IAB Establishment Panel and comprise every change of the ownership.

2 The percentage of each category do not equals the sum of the sub-categories because multiple answers were possible and some respondents identified two sub-categories as trigger events.

ence” means that newly hired employees, who worked in a company covered by a works council before, convinced the co-workers to establish a works council (13 percent). This category describes a network effect where the idea of co-determination spreads to other establishments in a certain region and industry. This idea is frequently used to instrument works councils in studies of economic effects of works councils (Mueller 2009).

Table 5.1: The Trigger Event for Establishing a Works Council³

	Observation	Percent
Organisational Shock	26	43.33
New Owner	19	31.66
Partial Plant Closure	2	3.33
Radical Reorganisation	9	15.00
Workers Voice	35	58.33
Conflicts between Management and the Workforce	6	10.00
Workers want More Co-Determination	11	18.33
New Workers with Works Council Experience	8	13.33
Management Knows no Reason	16	26.66
Managerial Communication	13	21.66
Improve Productivity	8	13.33
Improve Motivation	3	5.00
Need a Fixed Representative	8	13.33

Sample restriction: 60 companies that have established a works council between 2001 and 2005, answers were given by the managers and multiple answers were possible, source: IfM Bonn Works Council Survey 2005.

The third category, managerial communication (32 percent), refers to answers where the management is explicitly named to be involved in the establishing process. The first category “management demand a fixed representative” (13 percent) suggests that managers demand council’s mediation role. Council’s mediation role avoids transaction costs and solves commitment problems. These reasons may play also a role in the second and third categories

³ The classification in the three groups: managerial communication, workers voice and organisational shock, is based on logical connection, if the management was named in the question or if an organisational shock was asked. This classification cannot be obtained by a factor analyses because the most respondents tick only one possible answer and therefore a factor analyses can only be based on a minor sub-sample.

“managers want to improve productivity and motivation” (13 and 5 percent, respectively). These categories additionally refer the argument that works councils enhance the size of the enterprise pie.

In addition, the questionnaire allows multiple answers and one third of the respondents ticked more than one trigger event. For example, 14 of the 35 respondents of “workers voice” also identify the organisational shock of a “new owner” as a specific trigger event. In these cases, an owner change leads also to conflicts between management and workers or the new owner don’t know why the workers establish a works council after the owner change. Such multiple answers support the idea that risk protection spurred from enforcing the implicit contract is a prevalent trigger. Otherwise, the productivity enhancement argument of works councils seems to be a relevant trigger in a minor of cases.

Trigger agent

Our data additionally allow identifying trigger agents which give a more comprehensive insight into the establishing process. Even though only workers can formally establish a works council, managers can support the establishment of a works council. Then, intra-establishment conflicts may be less likely and, therefore, positive effects of works councils are more likely. Managers are involved in the establishment of works councils in about one third of cases. In these companies, managers actively want to moderate an intra-firm industrial relations change, once workers show interest in establishment-level codetermination. Furthermore, management itself encourages workers to establish a works council in approximately 7 percent of all cases. Management motivations for establishing worker representation are described in a case study by Schlömer et al. (2007). They cite a manager who knows positive effects of a works council from his previous job, particularly the mediation role of works councillors. To take advantage of worker representatives, he motivates the workforce to establish a works council in his new company. Nevertheless, workers alone trigger the establishment in the majority of all cases. Our results show that both, workforce alone and workforce in conjunction with management are prevalent initiators of council establishment.

Table 5.2: The Trigger Agent for Establishing a Works Council

	Observations	Percent
Workforce Alone	37	61.67
Management Involved	19	31.67
Management Motivated	4	6.67

Sample restriction: 60 companies that have established a works council between 2001 and 2005, answers were given by managers; Source: IfM Bonn Works Council Survey 2005.

We can also calculate descriptive statistics on the trigger events and agents for the entire sample, but the retrospective nature of the questions may cause recall problems for respondents and bias the results. For instance, we can show that the number of firms where managers was involved in the establishment process or have motivated workers to establish the works council significantly increase when the time-span between establishment of the works council and survey increases. This finding may be a tribute to good employment relations in those companies, where managers cannot imagine that they oppose employee representation.⁴

Table 5.3: Cross-Tabulation of Trigger Agent and Event Establishing a Works Council

		trigger event					
		Organisational Shock		Workers Voice		Managerial Communication	
trigger agent	Workforce Alone	18	0.42	25	0.58	0	0.00
		0.70		0.72		0.00	
	Management Involved	7	0.26	10	0.37	10	0.37
		0.27		0.28		0.77	
	Management Motivated	1	0.25	0	0.00	3	0.75
		0.03		0.00		0.23	

The trigger event question allowed for multiple answers; in each cell: top left = the number of cases; top right = the percentages of trigger agents (row); bottom left = the percentages of trigger events (column). Sample restriction: 60 companies that have established a works council between 2001 and 2005. Source: IfM Bonn Works Council Survey 2005.

⁴ Accordingly, Schlömer *et al.* (2007) cite managers who state, “if works councils do not exist, they have to be invented.”

Associations between trigger event and trigger agent

In addition, we examine associations between trigger events and agents. Table 5.3 shows that workers alone more likely establish a works council if an organisational shock occurs and workers want more voice. Contrary, table 5.3 confirms that managerial involvement is associated with management demand a fixed representative and wants to improve productivity and motivation.

Table 5.4: Relation between Trigger Agent and Trigger Event, Marginal Effects after Probit.

	Coef.	Z-Value	Coef.	Z-Value	Coef.	Z-Value
Dummy: Organisational Shock			0.3913	2.41 **	0.4773	2.66 **
Dummy: Workers Voice			0.5344	3.12 **	0.4384	2.26 **
Managerial Attitude towards Employee Representation					-0.3230	2.97 ***
Number of Employees	0.0042	1.74 *	0.0053	2.05 **	0.0040	1.45
Squared Number of Employees/1000	-0.0089	1.60	-0.0114	1.92 *	0.0000	1.13
Dummy: Owner-Manager	0.2742	1.66 *	0.2510	1.36	0.2524	1.29
Dummy: Single Site Company	0.0119	0.08	0.0651	0.38	0.1399	0.78
Dummy: Located in East Germany	0.1809	1.14	0.1594	0.96	0.2467	1.57
Industry Dummies	yes		yes		yes	
Number of Establishments	60		60		60	
LR chi(2)	8.13		20.54		33.57	
Pseudo R ²	0.1018		0.2571		0.4202	
Log Likelihood	-35.87		-29.66		-23.15	

Dependent Variable: One: Workforce Alone Triggers the Establishment of Works Council, Zero: Managerial Involvement during the Establishing Process. Sample restriction: companies that established a works council between 2001 and 2005; *, **, *** significant on the 10%, 5% or 1% level respectively. Source: IfM Bonn Works Council Survey 2005.

Further, we validate these correlations using a multivariate framework, whereby we control for additionally variables which also influence the probability that workers alone establish a works council.⁵ Table 5.4 shows the marginal effects after Probit and supports the descriptive findings. The variables of primary interest, an organisational shock and voice requirements, increase the probability that workers alone establish of a works council. An organisational shock increases this probability by 48 percent when we control for managerial attitude towards employee participation at the time of establishment (column 3). Further, a positive

managerial attitude decreases the probability that workforce alone calls for election, in other words, the management is involved in the establishment process. However, managerial attitude is obvious or highly endogenous and should cautiously be interpreted. Nevertheless, this result supports the importance of cooperative culture and leadership when evaluating voice regimes (Bryson 2004). All other variables are insignificant when we control for managerial attitude towards employee representation at the time of establishment.

The IfM Bonn works council survey directly asked managers of establishments that have introduced a works council about the trigger event. Unfortunately, this data set includes no information about a change of the owner or a restructuring in establishments that have not introduced a works council. Thus, we turn to the IAB Establishment Panel and analyses the relevance of these trigger events comparing establishments that have introduced a works council and that one that have not.

Trigger Events: Comparison to Uncovered Companies

The IAB Establishment Panel defines the trigger events slightly different. First, the data entail an additional categories, outsourcing, insourcing and spin-off. Second, the definition of the reorganisation differs so that we can only identify when a reorganisation occurs rather than a radical one. Therefore, a larger proportion of establishments should report such reorganisation and that's why we expect a lower probability of establishing a works council. Third, the data only allow an indirect measure of an new owner. We define an owner change when a firm was a single site company in the last year and is now a branch of a company. Note, this definition captures only a part of owner changes of the IfM Bonn Works Council survey. Additionally, we measure the employment growth which is identified in previous studies as a prevalent trigger and the deviation from sectoral GDP growth in the previous year which shows the development of newly established works councils over the business cycle.

Table 5.5 presents the descriptive statistics of the trigger events in the IAB Establishment Panel. Each organisational shock more frequently occurs in establishments with newly established works councils than in an establishment without one. For instance, reorganisations occur in 13 percent of all non-treated establishments but in 25 percent of the treated. Otherwise, partial plant closures are seldom but also happen 4.5 times more often in establishments with newly established works councils. Furthermore, works councils are more frequent established

⁵ The definition of all control variables are shown in appendix table 5.A3. All variables are collected in 2005. However, managerial attitude towards employee representation and the establishment size at the time establishment are specifically asked. All other used variables are assumed to be constant over time.

when the sectoral growth in the preceding year was 0.53 percentage points lower than average.

Table 5.5: Frequents of Trigger Events (IAB Establishment Panel)

	No Works Council	Newly Established Works Council
Organisational Shock	0.2339	0.3919
Partial Plant Closure	0.0150	0.0147
Spin-off of a Part of the Establishment	0.0089	0.0403
Outsourcing of a Part of the Establishment	0.0049	0.0110
Deviation from Sectoral Growth	0.0266	-0.5345
Integration of Another Establishment	0.0220	0.0549
New Owner	0.0097	0.0293
Reorganisation	0.1347	0.2527

Variables measure if an organisational shock occurs during the last year. Definition of all variables is in Table 5.A2 in appendix. Source: IAB Establishment Panel 1999-2007.

Table 5.6: Marginal Effects after Probit Regression of the Probability of Establishing a Works Council

	Coef.	Z-Value	Coef.	Z-Value
Organisational Shock	0.0026	3.12	0.0035	3.13
Deviation from Sectoral Growth			-0.0010	4.41
Employment Growth	-0.0064	0.67	-0.0076	0.61
Number of Employees / 1000	0.0165	4.71	0.0210	4.42
Squared Numb. of Employees/1000	-0.0025	2.56	-0.0032	2.26
Share of Skilled Workers	-0.0004	0.28	-0.0018	0.94
Share of Apprentices	-0.0020	0.55	-0.0038	0.77
Share of Part-time Workers	-0.0035	1.85	-0.0057	2.24
Export share	-0.0000	0.28	0.0000	0.65
log(Investment per Capita)	-0.0001	1.01	-0.0001	0.98
Collective Agreement	0.0045	5.01	0.0059	4.82
Wages above Collective Level	0.0004	0.42	0.0009	0.78
Old Establishment	-0.0017	1.93	-0.0020	1.68
Bad Economic Situation	-0.0001	0.15	0.0001	0.06
East German Establishment	-0.0026	3.17	-0.0027	2.43
Single Site Company	-0.0040	2.88	-0.0052	2.83
Limited Company	0.0032	2.68	0.0041	2.57
Foreign Owned Company	0.0056	2.54	0.0069	2.47
Number of Observations	25367		25367	
Prob > chi2	0.0000		0.0000	
Pseudo R2	0.1285		0.0860	

Dependent Variable: One = newly established works council, zero = no works council. Include industry dummies. Standard Errors are clustered on Establishment. Marginal effects are calculated on the mean of the dependent variable. Source: IAB Establishment Panel 1999-2007

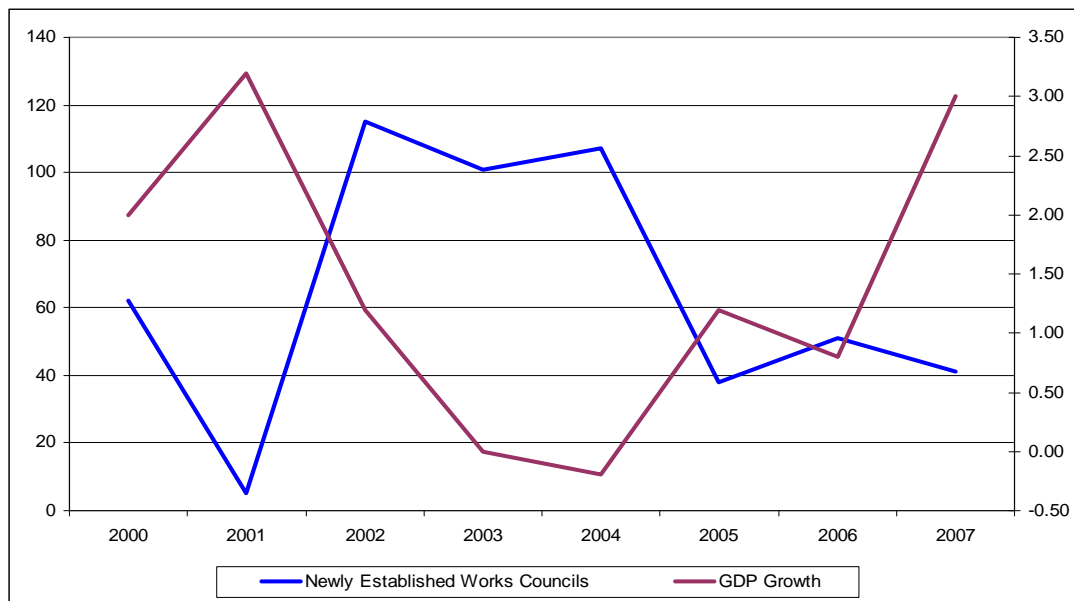
Table 5.6 presents the marginal effects of the determinants of establishing a works council after Probit. The occurrence of an organisational shock has a significant positive effect on the probability of establishing a works council. The marginal effect is 0.35 percent on all uncovered companies. This effect has to be compared with the probability of establishing a works council of 1.07 percent which yield an influence of more than one third.

Table 5.7: Probit Regression of the Probability of Establishing a Works Council

	Coef.	Z-Value	Coef.	Z-Value
Partial Plant Closure	-0.0017	0.78	-0.0026	0.85
Spin-off of a Part of the Establishment	0.0173	3.78	0.0181	3.46
Outsourcing of a Part of the Establishment	0.0031	0.67	0.0045	0.71
Deviation from Sectoral Growth			-0.0010	4.40
Integration of Another Establishment	0.0046	1.98	0.0062	2.06
New Owner	0.0029	1.00	0.0065	1.52
Reorganisation	0.0023	2.30	0.0030	2.29
Employment Growth	-0.0046	0.56	-0.0068	0.59
Number of Observations	25367		25367	
Prob > chi2	0.0000		0.0000	
Pseudo R2	0.1334		0.0907	

Dependent Variable: One = newly established works council, zero = no works council. The same control variables used as in table 5.6. Standard Errors are clustered on Establishment. Marginal effects are calculated on the mean of the dependent variable. Source: IAB Establishment Panel 1999-2007

Further, we separate the organisational shock in 6 categories (table 5.7). The shocks a spin-off of a part of the establishment, an integration of another establishment and a reorganisation have a positive impact on the probability of establishing a works council. Contrary a partial plant closure and an outsourcing of a part of the company have no significant effect but both shocks occur very seldom. Similar, a new owner has no influence on the establishment of a works council but we should note that we can only indirectly measure a change of the owner in the IAB Establishment Panel and therefore, this bias can drive the insignificance. However, our results demonstrate that organisational shocks have indeed an influence on the probability of establishing a works council.

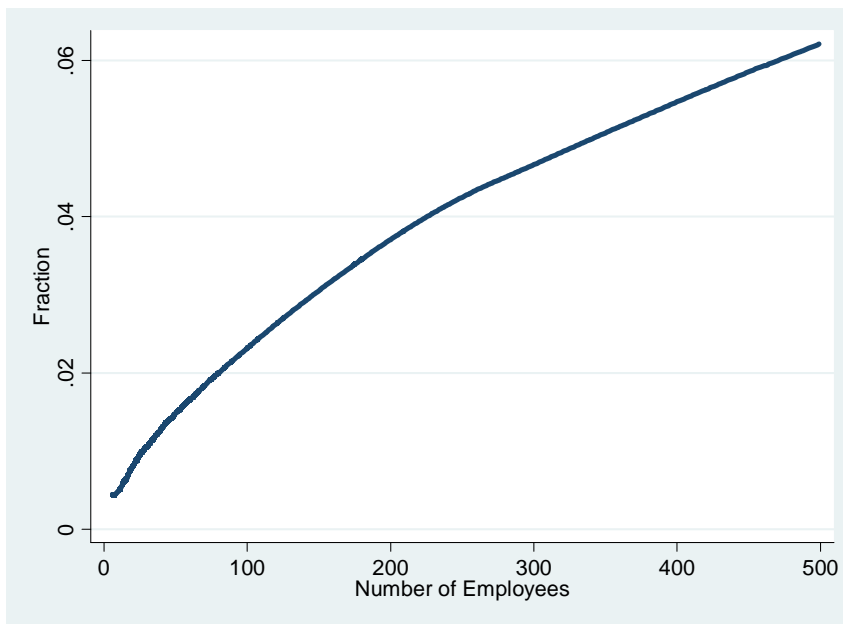
Figure 5.1: Number of Newly Established Works Councils and the Business Cycle

Source: IAB Establishment Panel 1999-2007 (own calculations), Federal Office of Statistics.

Furthermore, breaking the implicit contract cannot only result from specific organisational shock events but also a worse economic situation may force managers to cut fringe benefits or to claim higher efforts from workers. This source of breaking the implicit contract captures the deviation from the sectoral growth rate. Deviation from average sectoral growth preceding council's establishment has a significant negative impact on the probability of establishing a works council. This measure takes into account a different economic growth between industries whereby the average sectoral growth is the reference point. A negative deviation means that the sectoral growth rate is lower than the average of the sector during the last years and vice versa a positive deviation represents a higher. A one percent lower growth in the previous year increases the probability of establishing a works council of about 0.1 percent. Figure 5.1 underpins this interpretation. In figure 5.1, we plot the yearly number of newly established works councils and the previous year GDP growth. A higher GDP growth in the previous year is associated with a lower number of newly established works councils and vice versa.⁶ Works councils are more likely established during economic recessions than during boom periods after controlling for explicit organisational shocks. Thus, the risk protection strategy of workers is a motivation for establishing a works council.

⁶ We get a similar figure when we plot the year dummies against the number of newly established works councils.

Figure 5.2: Newly Established Works Council over Firm Size, Unconditioned Locally Weighted Regression



Source: IAB Establishment Panel 1999-2007. Note: The firm-size range is restricted to 500 employees because we observe too few bigger companies which have newly established a works council and therefore this estimator would not appropriate fit the extended firm size range.

The control variables have the expected signs. The firm size shows a positive concave shape. A larger number of employees indicate a more complex and hierarchical organisation in which a higher need of communication increase works council's benefits such as mitigate transaction costs. The finding shows, furthermore, that the increasing coverage of works councils by firm size stems not only from the fact that establishments with a works councils grow but also that larger uncovered firms more likely establish a works council. This relation illustrates figure 5.2. The probability of establishing a works council increases from less than a half percent in smallest eligible companies up to around 6 percent in companies of around 500 employees. Thus, larger firms have a higher probability of having a works council and the remaining uncovered firms have a higher probability of establishing a works council.

Furthermore, the proportion of part-time workers has a negative impact on the probability of establishing a works council which confirms recent findings that councils face difficulties in effectively representing part-time employees. Moreover, firms covered by a collective agreement more likely establish a works council. Furthermore, limited companies have a positive and single site companies a negative influence on the probability of establishment. Single site

companies may better reflect workers interests than multi-site companies because managers of multi-site companies have to consider different plants. Moreover, foreign owned firms have a higher probability of establishing a works council as foreign leadership leads to a higher wish of legal codetermination. Further, East German companies have a higher probability of establishing a works council. This indicates a convergence of industrial relations in both parts of Germany because the incidence of works councils in East Germany is smaller but the probability of establishing works councils is higher than in West Germany. Further, the export share on total sales and the investments have no influence.

Robustness Checks

We run a series of robustness checks for the estimations of the trigger events using the IAB Establishment Panel. First, we test the influence of all key explanatory variables alone. Second, we repeat the estimation for West Germany only. Both tests confirm our findings. Third, we exclude the reorganisation dummy because this variable has the highest weight in the organisation shock and, more important, was not regularly asked in the IAB Establishment Panel. Even if reorganisations are not regularly asked, the construction of this question allows interpolation to previous years. Nevertheless, this measure may not be as precise as the others. Therefore, we run all regressions without the reorganisation dummy and get qualitative and quantitative similar results for the key variables.

5.5 CONCLUSION AND DISCUSSION

This paper presents evidence for trigger events and associated agents of establishing a works council. We show that a change of the owner and organisational changes such as integration of another plant, a spin-off and restructuring lead to a higher probability of establishing a works council. These results show that workers demand works councils as an instrument of risk protection against deteriorate working conditions and to safeguard workplaces. Moreover, these trigger events specify recent findings that financial distress and declining employment causes the establishing of a works council because organisational shocks can occur in good and on bad times. However, sector-wide economic downturn still has an effect on the probability of establishing a works council.

Moreover, we show that while workforce alone is the most frequent trigger agent in about two thirds of all cases, management is involved in the other third and has in a minority of cases motivated workers to establish a works council. When managers are involved in the establish-

ing process, intra-firm industrial relations may be less conflicting during and after the establishing of a works council.

Our findings are also relevant for other countries of the European Economic Area (EEA), which following adoption of the EU's 2002 Information and Consultation of Employees Directive (ICE), are now all required to have provisions for the establishment of representative structures for employee information and consultation within national undertakings i.e. at workplace and/or company level. The rights specified in the Directive differ from the German Works Constitution Act, which provides more robust rights on the timing and quality of information provision, a more rigorous definition of consultation and, in addition, co-determination rights on a range of issues which in effect provide works councils with veto rights on personnel matters. These differences are likely to dilute the extent of the risk protection provided by national legislation introduced under the Directive as compared to Germany, and hence the incentive for workforces to seek the establishment of works council-type arrangements. Moreover, the Directive also provides considerable leeway for individual member states in framing their implementing national legislation (Carley and Hall 2008).

How far the findings of the present study are relevant to other EEA countries can be considered along two dimensions. The first is the robustness of information and consultation rights. Under Austrian and Dutch legislation, for example, these are equivalent to those specified in Germany. The same broadly applies to the rights of local trade organisations within companies under the basic agreements which govern industrial relations in the Nordic countries. In France and Spain, however, statutory consultation rights are weaker than in Germany – hence the rent protection incentive for workforce is reduced. In the UK and Ireland, where universal rights to employee information and consultation were unknown until the coming into force of national legislation implementing the EU directive (Hall 2006), the recent legislation's information rights are less precisely specified than in continental Western and Nordic Europe and consultation rights are weaker. Moreover, framing of the UK regulations leaves open the possibility for management and workforce representatives to negotiate 'private' arrangements outside of the formal procedures of the UK legislation. These so-called 'pre-existing' agreements (Hall, 2006) do not necessarily have to meet the information and consultation standards specified in the UK legislation. Nonetheless, even in the UK and Ireland, the weaker consultation rights do not necessarily impinge on the potential for obtaining credible information about economic situation which are necessary to overcome the information asymmetries after an organisational shock. Therefore, a works council basing on the ICE Directive can also be

an instrument for risk protection, for example, when the management cancel implicit contracts about fringe benefits or working conditions. Indeed, weaker co-determination rights may result in a weaker incentive for workforces to trigger the establishment of a works council. In other countries, management might be a relatively more prominent trigger agent in establishing a works council (cf. Hall et al. 2007 for the UK). Management incentives for promoting the establishment of works council-type arrangements are likely to be less impacted by these differences. Hence, in countries such as the UK and Ireland, management appears to be a relatively more prominent trigger agent (Hall et al. 2007).

The second dimension is the extent to which rights to information and consultation, and the corresponding works council-type structures, are well established and hence the likely costs and benefits well known to management and workers. In countries such as Germany, where the current legal framework has essentially been in place for more than half a century, then an equilibrium situation prevails. In contrast, where information and consultation rights have only recently been introduced, as in the UK, and a situation of transition prevails, both management and workforces have greater uncertainty about the potential costs and benefits involved. Equilibrium means here especially that, on the one hand, workers and managers are aware of works councils' statutory rights. These rights are taught in Germany, for example, during the apprenticeship where two thirds of a birth cohort is trained. On the other, unions see works councils as a complementary industrial relation institution in Germany and this mutual recognition evolved over a long period accompanied by an intensive conflict (Muel-ler-Jentsch 1995). Nevertheless, the role of works councils in a historic developed country specific system of industrial relations is hard to predict and therefore country specific institutions do not allow a direct application of our results.

APPENDIX**Table 5.A1:** Descriptive Statistics for the Estimation Sample of the IAB Establishment Panel.

	Mean	SD	Min	Max
Dependent Variables:				
Dummy: Newly Established Works Council	0.0108	0.1032	0	1
Explanatory Variables:				
Dummy: Organisational Shock	0.2339	0.4233	0	1
Partly Plant Closure	0.0150	0.1216	0	1
Spin-off of a Part of the Establishment	0.0089	0.0942	0	1
Outsourcing of a Part of the Establishment	0.0049	0.0697	0	1
Deviation from Sectoral Growth	0.0266	2.1829	-4.806	5.054001
Integration of Another Establishment	0.0220	0.1467	0	1
New Owner	0.0097	0.0980	0	1
Reorganisation	0.1347	0.3414	0	1
Employment Growth	0.0024	0.0304	-0.1467	0.9677
Employee Characteristics:				
Share of Apprentices	0.0616	0.0920	0	1
Share of Unskilled Workers	0.1954			
Share of Skilled Workers	0.7431	0.2593	0	1
Share of Part Time Workers	0.1790	0.2281	0	1
Establishment Characteristics:				
Number of Employees	38.6437	106.3574	6	5982
Dummy: Collective Barg. Contract	0.3935	0.4885	0	1
Dummy: Payment above Collective Level	0.2772	0.4476	0	1
Dummy: Establishment founded before 1989	0.7405	0.4384	0	1
Prospering profit situation	0.3067	0.4611	0	1
East German Establishment	0.4507	0.4976	0	1
Export share	4.7478	14.4786	0	100
Log(Investment per Capita)	5.0279	3.7946	0	13.66
Dummy: Limited Company	0.5906	0.4917	0	1
Dummy: Foreign Owned Company	0.0268	0.1614	0	1
Dummy: Single Side Company	0.3064	0.4610	0	1
Distribution by Industry:				
Cloth and Food Industry	0.0519	0.2219	0	1
Timber Industry	0.0536	0.2252	0	1
Chemical Industry	0.0453	0.2079	0	1

Metal Working Industry	0.0708	0.2566	0	1
Automotive Engineering	0.0499	0.2177	0	1
Electrical Industry	0.0449	0.2071	0	1
Construction	0.1569	0.3637	0	1
Wholesale and Retail	0.1806	0.3847	0	1
Logistic and Telecommunication	0.0409	0.1980	0	1
Services for Companies	0.1213	0.3265	0	1
Research and IT	0.0291	0.1682	0	1
Services for Households	0.0844	0.2780	0	1
Healthcare and Education	0.0704	0.2558	0	1
Number of Establishments	25367			

Table 5.A2: Descriptive Statistics for Companies with newly Established Works Council in the IAB Establishment Panel.

	Mean	SD	Min	Max
Dependent Variables:				
Dummy: Newly Established Works Council	1.0000	0.0000	1	1
Explanatory Variables:				
Dummy: Organisational Shock	0.3919	0.4891	0	1
Partly Plant Closure	0.0147	0.1204	0	1
Spin-off of a Part of the Establishment	0.0403	0.1970	0	1
Outsourcing of a Part of the Establishment	0.0110	0.1044	0	1
Deviation from Sectoral Growth	-0.5345	2.0388	-4.806	5.054001
Integration of Another Establishment	0.0549	0.2283	0	1
New Owner	0.0293	0.1690	0	1
Reorganisation	0.2527	0.4354	0	1
Employment Growth	0.0007	0.0105	-0.0667	0.0750
Employee Characteristics:				
Share of Apprentices	0.0540	0.0772	0	1
Share of Unskilled Workers	0.2331			
Share of Skilled Workers	0.7128	0.2918	0	1
Share of Part Time Workers	0.1496	0.2227	0	1
Establishment Characteristics:				
Number of Employees	116.8571	386.5874	6	5982
Dummy: Collective Barg. Contract	0.5495	0.4985	0	1
Dummy: Payment above Collective Level	0.3883	0.4883	0	1
Dummy: Establishment founded before 1989	0.7179	0.4508	0	1

Prospering profit situation	0.3187	0.4668	0	1
East German Establishment	0.3260	0.4696	0	1
Export share	6.5971	17.8007	0	100
Log(Investment per Capita)	5.1832	3.9042	0	12.83
Dummy: Limited Company	0.8425	0.3649	0	1
Dummy: Foreign Owned Company	0.0733	0.2610	0	1
Dummy: Single Side Company	0.0806	0.2727	0	1
Distribution by Industry:				
Cloth and Food Industry	0.0256	0.1584	0	1
Timber Industry	0.0623	0.2421	0	1
Chemical Industry	0.0513	0.2210	0	1
Metal Working Industry	0.0513	0.2210	0	1
Automotive Engineering	0.0696	0.2549	0	1
Electrical Industry	0.0513	0.2210	0	1
Construction	0.0879	0.2837	0	1
Wholesale and Retail	0.2161	0.4124	0	1
Logistic and Telecommunication	0.0586	0.2353	0	1
Services for Companies	0.1465	0.3543	0	1
Research and IT	0.0366	0.1882	0	1
Services for Households	0.0586	0.2353	0	1
Healthcare and Education	0.0842	0.2783	0	1
Number of Establishments	273			

Table 5.A3: Descriptive Statistics for Companies with newly Established Works Council in the IfM Bonn Works Council Survey (estimation sample at once).

	Mean	SD	Min	Max
Dependent Variables:				
Dummy: Initiator Workforce Alone	0.6167	0.4903	0	1
Dummy: Initiator Management Involved	0.3833	0.4903	0	1
Trigger Events:				
Workers Voice	0.4333	0.4997	0	1
Organisational Shock	0.5833	0.4916	0	1
Managerial Attitude towards Formal Employee Representation*	3.1166	1.0591	1	5
Company Characteristics:				
Number of Employees	174	119	18.6	440
Squared Number of Employees	44093	50997	346	193600
Dummy: Owner is Manager	0.3333	0.4754	0	1
Dummy: Single Side Company	0.3833	0.4903	0	1
Dummy: Located in East Germany	0.2500	0.4367	0	1
Distribution by Industry:				
Dummy: Manufacturing	0.2000		0	1
Dummy: Construction	0.0833	0.2787	0	1
Dummy: Trade	0.0333	0.1810	0	1
Dummy: Traffic	0.1000	0.3025	0	1
Dummy: Service for Companies	0.4833	0.5039	0	1
Dummy: Service for Households	0.1000	0.3025	0	1
Number of Observations	60			

* Scale from 1 (very negative attitude) to 5 (very positive attitude).

Table 5.A4: Itemized Answers of Trigger Event to Establish a Works Council

	Total Ob- servation	Workforce Alone	Management Motivated	Management Involved
New Owner	19	14	0	5
Partial Plant Closure	2	2	0	0
Radical Reorganisation	9	6	1	2
To Improve the Productivity	8	0	1	7
To Improve the Motivation	3	0	0	3
Need a Fixed Representative	8	0	2	6
New Workers with Works Council Experience	8	7	0	1
Conflicts between Management and the Workforce	6	5	0	1
Workers want More Co- Determination	11	8	0	3
Management Knows no Reason	16	9	0	7

Total numbers and percentages, multiple answers possible, source: IfM Bonn Works Council Survey 2005.

CHAPTER 6

Conclusions

This thesis studies the motivation of firms to provide apprenticeship training. Providing apprenticeships is one key for closing the gap between supply and the demand for apprentices which has been constantly discussed in recent years (Bundesministerium für Bildung und Forschung 2008, Jacobebbinghaus et al. 2009). The demand-supply gap has been alarming politicians for more than 35 years and led them to call for economic policy measures to adjust the apprenticeship market (Busemeyer 2009). Economic policy measures, however, have to be evaluated based on a sophisticated analysis of the apprenticeship market. The key for understanding the apprenticeship training market is firms' training motivation which determines the demand for apprentices and firms' recruiting strategy of apprenticeship graduates.

This thesis highlights that, contrary to previous understanding, the training motivation of firms in Germany is heterogeneous. Until recently, the demand of skilled workers was generally considered as firms' primary motivation to train apprentices. This view was underpinned by the stylized fact that nearly all training companies bear net-costs during the apprenticeship period (Bardeleben et al. 1997, Beicht et al. 2004). Even if some contributions remark that the training motivation may be heterogeneous across training firms, regarding firm size (Neubäumer and Bellmann 1999) and sector (Franz and Soskice 1995), the fact itself was never subjected to scrutiny.

Therefore, the first part of this thesis demonstrates that firms' training motivation is heterogeneous in Germany. This fact is shown using two different approaches: retaining own apprenticeship graduates (chapter 2) and differences between occupations in productivity and profitability of apprentices compared to unskilled workers (chapter 3). Concerning the retention rate, chapter two suggests a method for evaluating firms training motivation using the long-term or within-firm retention rate, defined as the proportion of apprenticeship graduates staying in the training firm to all apprenticeship graduates. The distribution of the within-firm retention rate over several years shows a strong clustering on both extremes. In detail, 14 percent of training companies do not retain their own apprenticeship graduates,

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whereas 26 percent hire nearly all apprenticeship graduates. At minimum, these 14 percent of all training companies have no possibility to benefit from returns after the training period, i.e. after the apprenticeship termination, and have to extract the benefits during the apprenticeship period. In other words, these companies cannot follow an investment strategy. This finding adds another interesting stylized fact of apprenticeship training and confirms to the idea of different training motivations. Furthermore, this method yields a similar classification as the marginal cost approach of the costs-benefits studies and is applicable with publicly available longitudinal datasets which allow analyses of broad areas of research questions.

Chapter three analyses the heterogeneity of firms' training motivation by evaluating the productivity and profitability of apprentices in comparison to unskilled or semi-skilled workers during the apprenticeship training period. This comparison reveals an additional view on firms' training motivation because it analysis the short-term opportunities of training companies – the employment of apprentices for unskilled work. Chapter three shows that apprentices are more productive and more profitable than unskilled workers in white-collar, crafts and construction occupations, but less profitable and equally productive in blue-collar manufacturing occupations. This finding can be interpreted as a lower bound for the investment training motivation: if apprentices are on average not as productive as unskilled workers, companies would not employ apprentices in order to cut unit labour costs. In other words, they invest in apprentices during the training period (at least as long as wage compression is low for unskilled workers). Contrary, training companies can follow a substitution training strategy when apprentices are more productive than unskilled workers during the training period.

Both chapters show that two opposing training motivations exist. The training motivation drives firms' demand for apprentices and is the key for understanding the apprenticeship training market. Both training motivations lead to different suggestions for policy measures designed to influence companies' demand for apprentices and, hence, the demand-supply gap on the apprenticeship training market. Assume, for instance, that all training companies train on the investment training motive. Thus, an appropriate policy measure for increasing the demand for apprentices is to extend the number of days at the vocational school to learn or practice a foreign language. This additional training increases the human capital of apprentices on the cost of the government which pays for vocational schools. Consider now the substitution training motive. Increasing the number of days at the vocational school would c.p. decrease the demand of apprentices. Because the critical variable for substitution motivated training firms is the unit labour costs of apprentices. The unit labour costs

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determine the incidence and intensity of training. More days at the vocational school lowers the time of apprentices at the workplace where they work productive, hence increases unit labour costs of apprentices compared to unskilled workers.

The training motivation further determines the recruitment of apprentices. The investment training motive implies retaining apprenticeship graduates whereas the substitution training motive does not implicate retaining apprenticeship graduates. The recruitment is further of theoretical concern because apprenticeship graduates are prone to be poached. Poaching can take place because the following preconditions are fulfilled: training companies invest in the skill of apprentices, these skills are transferable to and observable by other companies and an apprenticeship graduates can not be forced to work in the training company after the training period (Stevens 2001, Pischke 2007). Poaching of apprenticeship graduates can lead to an under-investment in training, regarding the training content, training duration, training incidence and number of apprentices. Therefore, the determinants of recruiting apprentices, in particular the existence and determinants of poaching are further keys to a better understanding of the apprenticeship training market.

Chapter four studies the existence and determinants of poaching. It shows that poached firms fail to credibly offer long-term contracts. Moreover, training firms more likely poach apprenticeship graduates trained elsewhere than non-training firms. This finding can be explained with apprentice's preferences to work in training firms. Moreover, non-training firms fail to attract apprenticeship graduates because training firms offer more likely long-term career opportunities. However, poaching does not lead to a non-training equilibrium. A large number of firms train although some of their apprenticeship graduates are likely to be poached. These firms may have incorporated a certain number of poached apprenticeship graduates in their calculation of training.

Poaching does not lead to a non-training equilibrium. This result is generally ascribed to the institutional framework of apprenticeship training in Germany (Finegold and Soskice 1988, Soskice 1994, Backes-Gellner 1996, Culpepper 2003). Institutions which are generally considered to constitute and foster the apprenticeship training system are employer and employee representations. An important employee representation in Germany is the works council. Works councils monitor apprenticeship training and foster apprentices' commitment to the training system because they do not fear to be exploited in the training firm. However, interdependencies between institutions such as works councils and the apprenticeship training system are a hardly researched field.

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Chapter five investigates the interdependence between apprenticeship training and works councils, more specifically whether the apprenticeship training intensity has an influence on the probability of establishing a works council. Chapter five finds no significant effect. However, this result should be carefully interpreted because chapter five firstly analyses interdependencies between a single industrial relations institution, the works councils, and the apprenticeship system and secondly neglects a dynamic dimension. A single institution of the industrial relation may have no effect on the apprenticeship training but the system of all industrial relations institutions may have an effect. This hypothesis that employer and employee associations and representations together provide the framework of the apprenticeship training system is stressed by Hall and Soskice (2001) and Culpepper (2003). Moreover, a dynamic dimension can create interdependencies between institutions in the long-run. For instance, the introduction of apprenticeship training or the increasing proportion of apprentices may have a lagged positive effect on establishing a works council after several years. Both considerations require a much more sophisticated empirical research design about institutions which foster apprenticeship training and cause the survival and development of such a system.

Taken together, the main findings of this thesis, the relevance of heterogeneous apprenticeship training motivation, determinants of poaching firms and interdependencies to institutions of the industrial relations system, request a much more careful design of policy measures intended to influence the apprenticeship market. However before intervening in the apprenticeship training market, politicians have to consider whether an intervention is necessary. Thus, Jacobebbinghaus et al. (2009) show, for instance, that the demographic development, in particular the increasing number of school leavers, is the critical variable that determines the demand-supply gap whereas the proportion of apprentices on all employees remain constant over the last years. Nevertheless if an intervention in the apprenticeship training market is necessary this thesis demonstrates that economic policy measures can differentially influence the demand of apprentices regarding both training motives. For instance, increasing or decreasing the days at the vocational school has a positive impact on one but a negative impact on the other training motive. On the contrary, policy measures such as training levy and enlarging the training duration may have no or positive effects regarding both training motivations. However, interdependencies to other institutions, preferences of apprentices, and substitution effects should also be taken into account before suggesting an economic policy measure.

References

- Acemoglu, D. (1997). Training and Innovation in an Imperfect Labor Market. *Review of Economic Studies*, 64(3), 445-464.
- Acemoglu, D., & Pischke, J.-S. (1998). Why Do Firms Train? Theory and Evidence. *Quarterly Journal of Economics*, 113(1), 79-119.
- Acemoglu, D., & Pischke, J.-S. (1999a). The Structure of Wages and Investment in General Training. *Journal of Political Economy*, 107(3), 539-572.
- Acemoglu, D., & Pischke, J.-S. (1999b). Beyond Becker: Training in Imperfect Labour Markets. *Economic Journal*, 109(453), 112-142.
- Addison, J. T., Bellmann, L., Pahnke, A., & Teixeira, P. (2008). A Note on the Determinants and Consequences of Outsourcing Using German Data. *IZA Discussion Paper*, 3608.
- Addison, J. T., Bellmann, L., Schnabel, C., & Wagner, J. (2003). German Works Councils Old and New: Incidence, Coverage and Determinants. *Schmollers Jahrbuch*, 123(3), 339-358.
- Addison, J. T., Schnabel, C., & Wagner, J. (1997). On the Determinants of Mandatory Works Councils in Germany. *Industrial Relations*, 36(4), 419-445.
- Addison, J. T., Schnabel, C., & Wagner, J. (2004). The Course of Research into the Economic Consequences of German Works Councils. *British Journal of Industrial Relations*, 42(2), 255-281.
- Addison, J. T., Zwick, T., & Teixeira, P. (2010). German Works Councils and the Anatomy of Wages. *Industrial and Labor Relations Review*, 63(2), 247-270.
- Aghion, P., Caroli, E., & Garcia-Penalosa, C. (1999). Inequality and Economic Growth: The Perspective of the New Growth Theories. *Journal of Economic Literature*, 37(4), 1615-1660.
- Ariga, Ken; Giorgio Brunello; Yasushi Ohkusa (2000): *Internal Labor Markets in Japan*. New York: Cambridge University Press.
- Askilden, J. E., & Nilsen, Ø. A. (2005). Apprentices and Young Workers: A Study of the Norwegian Youth Labour Market. *Scottish Journal of Political Economy*, 52(1), 1-17.
- Backes-Gellner, U. (1996). *Betriebliche Bildungs- und Wettbewerbsstrategien im Deutsch-Britischen Vergleich*. München und Mering: Hampp.
- Backes-Gellner, U., Frick, B., & Sadowski, D. (1997). Codetermination and Personnel Policies of German Firms: The Influence of Works Councils on Turnover and Further Training. *International Journal of Human Resource Management*, 8(3), 328-347.
- Bardeleben, R. v., Beicht, U., & Fehér, K. (1997). *Was kostet die betriebliche Ausbildung? Fortschreibung der Ergebnisse 1991 auf den Stand 1995*. Bielefeld: Bertelsmann.

References

- Bassanini, A., Booth, A. L., Brunello, G., De Paola, M., & Leuven, E. (2007). Workplace Training in Europe. In G. Brunello, P. Garibaldi & E. Wasmer (Eds.), *Education and Training in Europe*. Oxford: Oxford University Press.
- Beckmann, M. (2002). Firm-Sponsored Apprenticeship Training in Germany: Empirical Evidence from Establishment Data. *Labour: Review of Labour Economics and Industrial Relations*, 16(2), 287-310.
- Beicht, U., Walden, G., & Herget, H. (2004). *Kosten und Nutzen der betrieblichen Berufsausbildung in Deutschland*. Bielefeld: Bertelsmann.
- Bender, S., & Von Wachter, T. (2006). In the Right Place at the Wrong Time: The Role of Firms and Luck in Young Workers' Careers. *American Economic Review*, 96(5), 1679-1705.
- Black, S. E., & Lynch, L. M. (1996). Human-Capital Investments and Productivity. *American Economic Review*, 86(2), 263-267.
- Blundell, R., & Bond, S. (1998). Initial Conditions and Moment Restrictions in Dynamic Panel Data Models. *Journal of Econometrics*, 87(1), 115-143.
- Boockmann, B., & Steiner, V. (2006). Cohort Effects and the Returns to Education in West Germany. *Applied Economics*, 38(10), 1135-1152.
- Booth, A. L., & Snower, D. J. (1995). Introduction: Does the Free Market Produce Enough Skills? In A. L. Booth & D. J. Snower (Eds.), *Acquiring Skills: Market Failures, their Symptoms and Policy Responses* (pp. 1-18). Cambridge: Cambridge University Press.
- Brown, C., & Medoff, J. L. (2003). Firm Age and Wages. *Journal of Labor Economics*, 21(3), 677-697.
- Brunello, G., & De Paola, M. (2009). Is There under-Provision of Training. *Empirical Research in Vocational Education and Training*, 1(1), 1-18.
- Bryson, A. (2004). Managerial Responsiveness to Union and Nonunion Worker Voice in Britain. *Industrial Relations*, 43(1), 213-241.
- Büchel, F., & Neubäumer, R. (2001). Ausbildungsinadäquate Beschäftigung als Folge branchenspezifischer Ausbildungsstrategien. *Mitteilungen aus der Arbeitsmarkt- und Berufsforschung*, 34(3), 269-285.
- Bundesministerium für Bildung und Forschung. (2008). Berufsbildungsbericht. Berlin.
- Busemeyer, M. (2009). Die Sozialpartner und der Wandel in der Politik der beruflichen Bildung seit 1970. *Industrielle Beziehungen*, 16(3), 273-294.
- Cahuc, P., Sevestre, P., & Zajdela, H. (1990). Négociations salariales et segmentation du marché du travail. *Economie et prevision*, 92-93, 43-50.
- Cappelli, P., & Neumark, D. (2004). External Churning and Internal Flexibility: Evidence on the Functional Flexibility and Core-Periphery Hypotheses. *Industrial Relations*, 43(1), 148-182.

References

- Carley, M., & Hall, M. (2008). Impact of the Information and Consultation Directive on Industrial Relations: EIRO. *European Foundation for the Improvement of Living and Working Conditions*, Report March 2009.
- Chang, C., & Wang, Y. (1996). Human Capital Investment under Asymmetric Information: The Pigovian Conjecture Revisited. *Journal of Labor Economics*, 14(3), 505-519.
- Cornelissen, T., Heywood, J. S., & Jirjahn, U. (2008). *Performance Pay, Risk Attitudes and Job Satisfaction*. SOEP Paper No. 136.
- Culpepper, P. D. (2003). The Future of the High-Skill Equilibrium in Germany. *Oxford Review of Economic Policy*, 15(1), 43-59.
- Dearden, L., Reed, H., & Van Reenen, J. (2006). The Impact of Training on Productivity and Wages: Evidence from British Panel Data. *Oxford Bulletin of Economics and Statistics*, 68(4), 397-421.
- Dilger, A. (2003). Payment Schemes, Returns and Works Councils. *Schmollers Jahrbuch*, 123(3), 383-395.
- Dionisius, R., Muehlemann, S., Pfeifer, H., Walden, G., Wenzelmann, F., & Wolter, S. C. (2009). Costs and Benefits of Apprenticeship Training. A Comparison of Germany and Switzerland. *Applied Economics Quarterly*, 55(1), 7-37.
- Dustmann, C., & Schönberg, U. (2008). Apprenticeship Training and Commitment to Training Provision. *Leading House Working Paper*, 32.
- Dustmann, C., & Schönberg, U. (2009). Training and Union Wages. *Review of Economics & Statistics*, 91(2), 363-376.
- Elbaum, B., & Singh, N. (1995). The Economic Rationale of Apprenticeship Training: Some Lessons from British and U.S. Experience. *Industrial Relations*, 34(4), 593-622.
- Euwals, R., & Winkelmann, R. (2004). Training Intensity and First Labor Market Outcomes of Apprenticeship Graduates. *International Journal of Manpower*, 25(5), 447-462.
- Festerer, J., Pischke, J.-S., & Winter-Ebmer, R. (2008). Returns to Apprenticeship Training in Austria: Evidence from Failed Firms. *Scandinavian Journal of Economics*, 104(4), 733-753.
- Finegold, D., & Soskice, D. (1988). The Failure of Training in Britain: Analysis and Prescription. *Oxford Review of Economic Policy*, 4(3), 21-53.
- Fitzenberger, B., Osikominu, A., & Volter, R. (2006). Imputation Rules to Improve the Education Variable in the IAB Employment Subsample. *Schmollers Jahrbuch*, 126(3), 405-436.
- Fougere, D., & Schwerdt, W. (2002). Are Apprentices Productive? *Konjunkturpolitik*, 48(3-4), 317-346.
- Franz, W., & Soskice, D. (1995). The German Apprenticeship System. In F. Buttler, W. Franz, R. Schettkat & D. Soskice (Eds.), *Institutional Frameworks and Labor Market*

References

- Performance: Comparative Views on the U.S. and German Economies* (pp. 208-234). London: Routledge.
- Franz, W., & Zimmermann, V. (2002). The Transition from Apprenticeship Training to Work. *International Journal of Manpower*, 23(5), 411-425.
- Freeman, R. B., Edward P. Lazear. (1995). An Economic Analysis of Works Councils. In J. Rogers & W. Streeck (Eds.), *Works Councils Consultation, Representation, and Cooperation in Industrial Relations* (Vol. III, pp. 27-50). Chicago: University of Chicago Press.
- Freeman, R. B., James L. Medoff. (1984). *What Do Unions Do?* New York: Harper Collins.
- Frege, C. M. (2002). A Critical Assessment of the Theoretical and Empirical Research on German Works Councils. *British Journal of Industrial Relations*, 40(2), 221-249.
- Frick, A. (2006). Übersicht über den Stand und offene Fragen der Berufsbildungsökonomie. In A. Frick & A. Wirz (Eds.), *Berufsbildungsökonomie: Stand und offene Fragen* (pp. 15-43). Zürich.
- Geel, R., Backes-Gellner, U., & Mure, J. (2008). Specificity of Occupational Training and Occupational Mobility: An Empirical Study Based on Lazear's Skill-Weights Approach. *Leading House Working Paper*, 38.
- Göggel, K., & Zwick, T. (2009). Good Occupation - Bad Occupation? The Quality of Apprenticeship Training. *ISU Working Paper Series*, 45.
- Gospel, H. (1995). The Decline of Apprenticeship Training in Britain. *Industrial Relations*, 26(1), 32-44.
- Gospel, H. (1998). The Revival of Apprenticeship Training in Britain? *British Journal of Industrial Relations*, 36(3), 435-457.
- Hall, M. (2006). A Cool Response to the Ice Regulations? Employer and Trade Union Approaches to the New Legal Framework for Information and Consultation. *Industrial Relations Journal*, 37(5), 456-472.
- Hall, M., & Soskice, D. (2001). *Varieties of Capitalism*. Oxford: Oxford University Press.
- Hall, M., Sue Hutchinson, Jane Parker, John Purcell and Mike Terry. (2007). Implementing Information and Consultation: Early Experience under the ICE Regulations. *Employment Relations Research Series*, 88.
- Harhoff, D., & Kane, T. J. (1997). Is the German Apprenticeship System a Panacea for the U.S. Labor Market? *Journal of Population Economics*, 10(2), 171-196.
- Heckman, J., Roselius, R., & Smith, J. (1994). U.S. Education and Training Policy: A Re-Evaluation of the Underlying Assumptions Behind the "New Consensus". In L. Solmon & A. Levenson (Eds.), *Labor Markets, Employment Policy, and Job Creation* (pp. 83-122). Boulder: Westview Press.
- Heywood, J. S., & Jirjahn, U. (2009). Profit Sharing and Firm Size: The Role of Team Production. *Journal of Economic Behavior and Organization*, 71(2), 246-258.

References

- Hübler, O., & Jirjahn, U. (2003). Works Councils and Collective Bargaining in Germany: The Impact on Productivity and Wages. *Scottish Journal of Political Economy*, 50(4), 471-491.
- Jacobebbinghaus, P. (2008). LIAB-Datenhandbuch, Version 3.0. *FDZ Datenreport 03/2008*.
- Jacobebbinghaus, P., Mohrenweiser, J., & Zwick, T. (2009). Wie kann die Ausbildungsquote in Deutschland korrekt gemessen werden? *Wirtschafts- und Sozialstatistisches Archiv*, 3(4), 225-240.
- Janssen, S., & Pfeifer, C. (2009). Betriebsinterne Arbeitsmärkte, Hierarchien und Neueinstellungen: Eine empirische Untersuchung mit Personaldaten. *Zeitschrift für Betriebswirtschaft*, 75(5), 633-662.
- Jirjahn, U. (2009). The Introduction of Works Councils in German Establishments – Rent Seeking or Rent Protection? *British Journal of Industrial Relations*, 47(3), 521-545.
- Jirjahn, U., & Smith, S. C. (2006). What Factors Lead Management to Support or Oppose Employee Participation - with and without Works Councils? Hypotheses and Evidence from Germany. *Industrial Relations*, 45(4), 650-680.
- Kahneman, D., Knetsch, J. L., & Thaler, R. H. (1991). Anomalies: The Endowment Effect, Loss Aversion, and Status Quo Bias. *Journal of Economic Perspectives*, 5(1), 193-206.
- Katz, E., & Ziderman, A. (1990). Investment in General Training: The Role of Information and Labour Mobility. *Economic Journal*, 100(403), 1147-1158.
- Kessler, A. S., & Lülfsmann, C. (2006). The Theory of Human Capital Revisited: On the Interaction of General and Specific Investments. *Economic Journal*, 116(514), 903-923.
- Kölling, A. (2000). The Iab-Establishment Panel. *Schmollers Jahrbuch*, 120(2), 291-300.
- Kraft, K., & Lang, J. (2008). The Causes and Consequences of Adopting a Works Council. *Jahrbuch für Nationalökonomie und Statistik*, 228(5), 512-532.
- Lazear, E. P. (1986). Raids and Offer-Matching. *Research in Labor Economics*, 8(A), 141-165.
- Lazear, E. P. (2009). Firm-Specific Human Capital: A Skill-Weights Approach. *Journal of Political Economy*, 117(5), 914-940.
- Leuven, E. (2005). The Economics of Private Sector Training: A Survey of the Literature. *Journal of Economic Surveys*, 19(1), 91-111.
- Leuven, E., Oosterbeek, H., Sloof, R., & Van Klaveren, C. (2004). Worker Reciprocity and Employer Investment in Training. *Economica*, 72(285), 137-149.
- Lewis, P., & Ryan, P. (2009). Does Inspection under-Rate Apprenticeship Training by Employers?, *Empirical Research in Vocational Education and Training* 1(1), pp. 39-63

References

- Lindley, R. M. (1975). The Demand for Apprentice Recruits by the Engineering Industry, 1951-71. *Scottish Journal of Political Economy*, 22(1), 1-24.
- Malcomson, J. M., Maw, J. W., & McCormick, B. (2003). General Training by Firms, Apprentice Contracts, and Public Policy. *European Economic Review*, 47(2), 197-227.
- Moen, E. R., & Rosen, A. (2004). Does Poaching Distort Training? *Review of Economic Studies*, 71(4), 1143-1162.
- Mohrenweiser, J., & Backes-Gellner, U. (2010). Apprenticeship Training - What For: Investment or Substitution? *International Journal of Manpower*, forthcoming.
- Mohrenweiser, J., & Zwick, T. (2009). Why Do Firms Train Apprentices? The Net Cost Puzzle Reconsidered. *Labour Economics*, 16(6), 631-637.
- Müller, S. (2009). Are the firm owners really worse off with a works council? *Bavarian Graduate Program in Economics Discussion Paper*, No. 81.
- Müller-Jentsch, W. (1995). Germany: From Collective Voice to Co-Management. In J. Rogers & W. Streeck (Eds.), *Works Councils Consultation, Representation, and Cooperation in Industrial Relations* (Vol. III, pp. 53-79). Chicago: University of Chicago Press.
- Neubäumer, R., & Bellmann, L. (1999). Ausbildungsintensität und Ausbildungsbeteiligung von Betrieben: Theoretische Erklärungen und empirische Ergebnisse auf der Basis des IAB-Betriebspanels 1997. In D. Beer, B. Frick, R. Neubäumer & W. Sesselmeier (Eds.), *Die Wirtschaftlichen Folgen von Aus- und Weiterbildung* (pp. 9-41). München: Rainer Hampp.
- Pfeffer, J., & Cohen, Y. (1984). Determinants of Internal Labor Markets in Organizations. *Administrative Science Quarterly*, 29(4), 550-572.
- Pischke, J.-S. (2007). Comments on "Workplace Training in Europe". In: G. Brunello, P. Garibaldi, E. Wasmer (Eds.), *Education and Training in Europe* (pp. 330-342). Oxford: Oxford University Press.
- Ramey, G., & Watson, J. (1997). Contractual Fragility, Job Destruction, and Business Cycles. *Quarterly Journal of Economics*, 112(3), 873-911.
- Roodman, D. (2006). How to Do Xtabond2: An Introduction to "Difference" and "System" GMM in Stata. *Center for Global Development Working Paper*, No. 103.
- Ryan, P. (2000). The Attributes and Institutional Requirements of Apprenticeship: Evidence from Smaller EU Countries. *International Journal of Training and Development*, 4(1), 42-65.
- Ryan, P. (2001). The School-to-Work Transition: A Cross-National Perspective. *Journal of Economic Literature*, 39(1), 34-92.
- Sadowski, D. (1980). *Berufliche Bildung und betriebliches Bildungsbudget zur ökonomischen Theorie der Personalbeschaffungs- und Bildungsplanung im Unternehmen*. Stuttgart: Poeschel Verlag.

References

- Schaack, K. (2008). *Why Do German Companies Invest in Apprenticeships*. Berlin: Klaus Schwarz Verlag.
- Schlömer, N., Rosemarie Kay, Uschi Backes-Gellner, Wolfgang Rudolph, Wolfram Wassermann. (2007). *Mittelstand und Mitbestimmung Unternehmensführung, Mitbestimmung und Beteiligung in mittelständischen Unternehmen*. Münster: Westfälisches Dampfboot.
- Schwerdt, W., & Bender, S. (2003). Was tun Lehrlinge nach ihrer Ausbildung? Eine Analyse mit dem Linked Employer-Employee-Datensatz des IAB. *Mitteilungen aus der Arbeitsmarkt- und Berufsforschung*, 36(1), 46-59.
- Smith, S. C. (1991). On the Economic Rationale for Codetermination Law. *Journal of Economic Behavior and Organization*, 16(3), 261-281.
- Smits, W. (2006). The Quality of Apprenticeship Training. *Education Economics*, 14(3), 329-344.
- Smits, W. (2007). Industry-Specific or Genetic Skills? Conflicting Interests of Firms and Workers. *Labour Economics*, 14(3), 653-663.
- Smits, W., & Zwick, T. (2004). Why Do Business Service Firms Employ Fewer Apprentices? A Comparison between Germany and the Netherlands. *International Journal of Manpower*, 25(1), 36-54.
- Soskice, D. (1994). Reconciling Markets and Institutions: The German Apprenticeship System. In L. M. Lynch (Ed.), *Training and the Private Sector: International Comparisons* (pp. 26-60). Chicago: University of Chicago Press.
- Steedman, H. (1993). The Economics of Youth Training in Germany. *Economic Journal*, 103(420), 1279-1291.
- Steedman, H. (2001). Benchmarking Apprenticeship: UK and Continental Europe Compared. *CEP Discussion Papers*, 513.
- Stevens, M. (1994). An Investment Model for the Supply of Training by Employers. *Economic Journal*, 103(424), 556-570.
- Stevens, M. (1996). Transferable Training and Poaching Externalities. In A. L. Booth & D. J. Snower (Eds.), *Acquiring Skills - Market Failures, Their Symptoms and Policy Responses* (pp. 19-37): Cambridge University Press.
- Stevens, M. (2001). Should Firms Be Required to Pay for Vocational Training? *Economic Journal*, 111(473), 485-505.
- Streeck, W. (1989). Skills and the Limits of Neo-Liberalism: The Enterprise of the Future as a Place of Learning. *Work Employment Society*, 3(1), 89-104.
- Tuor, S., & Backes-Gellner, U. (2010). Avoiding Labor Shortages by Employer Signaling - on the Importance of Good Work Climate and Labor Relations. *Industrial and Labor Relations Review*, 63(2), 271-286.

References

- Tuor, S., & Backes-Gellner, U. (2010). Risk-Return Trade-Offs to Different Educational Paths. *International Journal of Manpower*, forthcoming.
- Tversky, A. & Kahneman, D. (1991). Loss Aversion in Riskless Choice: A Reference-Dependent Model. *Quarterly Journal of Economics*, 107(4), 1039-1061.
- Visser, J. (1995). The Netherlands: From Paternalism to Representation. In J. Rogers & W. Streeck (Eds.), *Works Councils Consultation, Representation, and Cooperation in Industrial Relations* (Vol. III, pp. 79-114). Chicago: University of Chicago Press.
- Wenzelmann, F., Schönfeld, G., Pfeifer, H., & Dionisius, R. (2009). Betriebliche Berufsausbildung: eine lohnende Investition für die Betriebe. *Bundesinstitut für Berufsbildung: Berichte zur beruflichen Bildung*, 8.
- Willman, P., Bryson, A., & Gomez, R. (2006). The Sound of Silence: Which Employers Choose No Employee Voice and Why? *Socio-Economic Review*, 4(2), 283-299.
- Windmeijer, F. (2005). A Finite Sample Correction for the Variance of Linear Efficient Two-Step Gmm Estimators. *Journal of Econometrics*, 126(1), 25-51.
- Winkelmann, R. (1996). Employment Prospects and Skill Aquisition of Apprenticeship Trained Workers in Germany. *Industrial and Labor Relations Review*, 49(4), 658-672.
- Winkelmann, R. (1997). How Young Workers Get Their Training: A Survey of Germany Versus the United States. *Journal of Population Economics*, 10(2), 159-170.
- Winter-Ebmer, R., & Zweimüller, J. (1999). Firm-Size Wage Differentials in Switzerland: Evidence from Job-Changers. *American Economic Review*, 89(2), 89-93.
- Wolter, S. C., Mühlemann, S., & Schweri, J. (2006). Why Some Firms Train Apprentices and Many Others Do Not. *German Economic Review*, 7(3), 249-264.
- Wolter, S. C., & Schweri, J. (2002). The Cost and Benefit of Apprenticeship Training: The Swiss Case. *Konjunkturpolitik*, 48(4), 347-367.
- Zwick, T. (2004). Employee Participation and Productivity. *Labour Economics*, 11(6), 715-740.
- Zwick, T. (2005). Continuing Vocational Training Forms and Establishment Productivity in Germany. *German Economic Review*, 6(2), 155-184.
- Zwick, T. (2007). Apprenticeship Training in Germany - Investment or Productivity Driven? *Zeitschrift für Arbeitsmarktforschung*, 40(2/3), 193-204.

Curriculum Vitae

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WORK EXPERIENCE

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